JUNE 2002
ISSUE #499
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73® Amateur Radio Today

Build:

- 6m Fun Loop
- RF Xfmrs
- Freq Counter
- Solder Station
- Icom Interface
- Windowsill Mount

CQ de Skogen
page 31

Glow, Little Glo-Bar

How Home-brew Home Grew

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- 430 ~ 450 MHz TX/RX
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- All memories capable of odd splits
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JUNE 2002
ISSUE #499

73 Amateur Radio Today

TABLE OF CONTENTS

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El Supremo & Founder
Wayne Green W2NSD/1

Associate Publisher
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Executive Editor
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Managing Editor
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Technical Editor
Larry Antonuk WB9RRT

Contributing Culprits
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Joe Moell KØOV
Steve Nowak KE8YN/0
Dr. Rick Olsen N6NR

Advertising Sales
Evelyn Garrison WS7A
21704 S.E. 35th St.
Issaquah WA 98029
425-557-9611
Fax: 425-557-9612

Circulation
Frances Hyvarinen

Data Entry & Other Stuff
Norman Marion

Business Office
Editorial - Advertising - Circulation
Feedback - Product Reviews
73 Amateur Radio Today Magazine
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FEATURES

10 **6m Fun Loop — N2DCH**
A low-cost gain antenna for the VHF technician.

12 **Roll Your Own RF Transformers — K8ZOA**
But don't get TOO wound up in it.

20 **Build This Commercial-Quality Counter: Part 2 of 2 — K8IHQ**
Amaze your friends — and yourself!

25 **Temp-Controlled Solder Station — AA2JZ**
Here's a simple project to improve your bench.

27 **Restoring an HQ-140-X — Part II — W6WTU**
This Hammarlund rig has always been a favorite.

31 **Travels with Henryk — Part 5 — SMØJHF**
The niceties of Norway.

33 **Glow, Little Glo-Bar — K8IHQ**
We bet this gets YOU thinking.

35 **Icom Interface, Texas-Style — W5RR**
This mod for 706/706MKII owners has concepts everybody can use.

36 **Windowsill Mount for Verticals — HL1/N8HI**
For when you're not flying the flag.

52 **Techniques Time Line — W6WTU**
How much do YOU know about the evolution of construction practices?

DEPARTMENTS

49 **Ad Index**
42 **Above & Beyond — WB6IGP**
64 **Barter 'n' Buy**
37 **Calendar Events**
47 **The Digital Port — KB7NO**
40 **Hamsats — W5ACM**
44 **Homing In — KØOV**
8 **Letters**
4 **Never Say Die — W2NSD/1**
48 **New Products**
39 **On the Go — KE8YN/Ø**
60 **Propagation — Gray**
1 **QRX**
63 **Radio Bookshop**

E-Mail
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Web Page
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QRX . . .

New Industry Group

The licensed United States amateur radio population is around three-quarters of a million hams. Scanner and shortwave listeners might be double this figure, and the popular GMRS, Family Radio Service, and new multi-use radio service have attracted well over one million operators. Prominent noncommercial radio user groups like the Personal Radio Steering Group (Ann Arbor, Michigan) and the American Radio Relay League represent the interests of users, but some radio industry officials feel there may be a lot more that the radio industry might do to help spread the word about these sometimes understated

Continued on page 6

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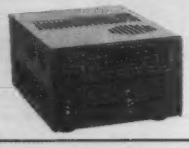

MODEL SS-10TK

MODEL SS-12IF

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
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OUTPUT VOLTAGE: 13.8VDC

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅞ x 6 x 9	3.2
SS-12	10	12	1⅞ x 6 x 9	3.4
SS-18	15	18	1⅞ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅝	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0

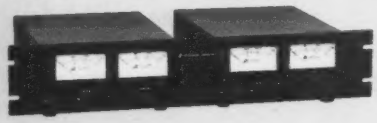
MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0



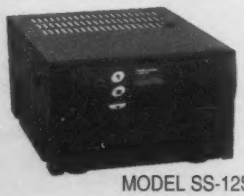
MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0



MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

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Available in 20, 30, or 40 Meters, these neat little transmitters put out 1 Watt!

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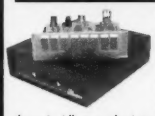
35 WATT LPFM STEREO TRANSMITTER

- ✓ 35W RF output, VSWR protected
- ✓ Automatic audio & power controls
- ✓ Digital synthesized PLL
- ✓ Full front panel control
- ✓ 110/220VAC, 12VDC operation

Whether your application is export or LPFM, the PX1 has you covered. From the over-rated continuous duty power supply & power amplifier to the 2 line vacuum fluorescent display, your station will be the easiest to setup and the most reliable for continuous operation. Full microprocessor controls provide a "virtual engineer". Check out www.highpowerfm for full details.

PX1	**35W Professional FM Stereo Transmitter**	**$1,795.95**

TOUCH-TONE TONE GRABBER NEW!



- ✓ New-built-in RJ11 phone jack
- ✓ Large memory holds over 500 numbers
- ✓ Big bold 8 digit display, auto insertion of dashes
- ✓ New-output latch jack

Dialed phone numbers on the radio, repeater codes, control codes, anywhere touch-tones are used, you can read and store them! All new design for 2002. Capture those tones with the TG2!

TG2	**Tone Grabber Tone Reader Kit**	**$59.95**
CTG2	**Matching Case & Knob Set**	**$14.95**
AC125	**110 VAC Power Adapter**	**$9.95**

ELECTROCARDIOGRAM HEART MONITOR

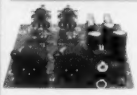
- ✓ Visible and audible display of your heart rhythm
- ✓ Re-usable sensors included; just like visiting the hospital!
- ✓ Bright LED "beat" indicator
- ✓ Monitor output for oscilloscope display

NEW!

Enjoy learning about the inner workings of the heart while covering the stage by stage electronic circuit theory of ECG/EKG systems. Be heart smart and learn at the same time!

ECG1	**Electrocardiogram Heart Monitor Kit**	**$34.95**
CECG	**Matching Case & Knob Set**	**$14.95**
AC125	**110 VAC Power Adapter**	**$9.95**
ECGP10	**Replacement Reusable Probe Patches (10-Pack)**	**$7.95**

XLR TO RCA AUDIO CONVERTER NEW!



- ✓ Connect consumer outputs to XLR inputs
- ✓ Left & right audio gain adjustments

So you're trying to connect consumer audio outputs with RCA connectors (unbalanced) to XLR (balanced) inputs. Always a problem...Not anymore with the R2XL1!

R2XL1	**Unbalanced to Balanced Audio Converter Kit**	**$49.95**
CR2XL	**Matching Case & Knob Set**	**$14.95**
PWR25	**12VAC Power Adapter**	**$9.95**

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PROFESSIONAL FM STEREO RADIO STATION

- ✓ Synthesized 88 to 108 MHz with no drift !
- ✓ Built-in mixer – 2 line inputs and one microphone input!
- ✓ High power module available for export use
- ✓ Low pass filter for great audio response

Our FM100 is used all over the world by serious hobbyists as well as churches, drive-in theaters, and schools. Frequency synthesized PLL assures drift-free operation with simple front panel frequency selection. Built-in audio mixer features LED bargraph meters to make setting audio a breeze. The kit includes metal case, whip antenna and built-in 110 volt AC power supply.

FM100	**Super-Pro FM Stereo Radio Station Kit**	**$249.95**
FM100WT	**1 Watt, Wired Export Version**	**$399.95**

SYNTHESIZED FM STEREO TRANSMITTER

- ✓ All new design & features for 2002!
- ✓ Fully adjustable RF output

NEW!

Our #1 kit for years has just gotten better for 2002! Totally redesigned, the FM25B has all the features you've asked for. From variable RF output, F connector RF output jack, line input, loop output, and more. Includes case, power supply, whip antenna, audio cables.

FM25B	**Synthesized FM Stereo Transmitter Kit**	**$129.95**

AUTOMATIC COLOR/BW IR CAMERA

- ✓ Color during the day, IR B&W at night!
- ✓ Automatically turns on IR Illumination!
- ✓ Waterproof to IP57 standards!
- ✓ Black anodized housing with universal mount

NEW!

Best of both worlds! This video camera is a waterproof COLOR camera during the day. When the light level drops, it automatically changes to B&W and turns on its built-in IR illumination, with 10 IR LEDs. Powered by 12VDC and terminated with a professional BNC connector. B&W only model also available if color is not needed. Both in heavy anodized black housing.

CCD309	**Color/B&W IR Waterproof Bullet Camera**	**$169.95**
CCD308	**B&W IR Waterproof Bullet Camera**	**$109.95**
AC125	**110 VAC Power Adapter**	**$9.95**

MINI B&W CAMERA WITH IR ILLUMINATION

- ✓ Built in IR illumination!
- ✓ Sees in total darkness!

NEW!

What a deal! This miniature B&W video camera has 6 high power IR LEDs built into it to provide illumination in total darkness! No need for external IR illuminators. Attractive black aluminum housing easily mounts at any angle with the built-in swivel bracket. Runs on 12VDC, and includes professional BNC output plug-in harness.

CCD303	**Mini B&W IR Illuminated Camera**	**$59.95**
AC125	**110 VAC Power Adapter**	**$9.95**

Check out all our other new cameras at www.ramseykits.com

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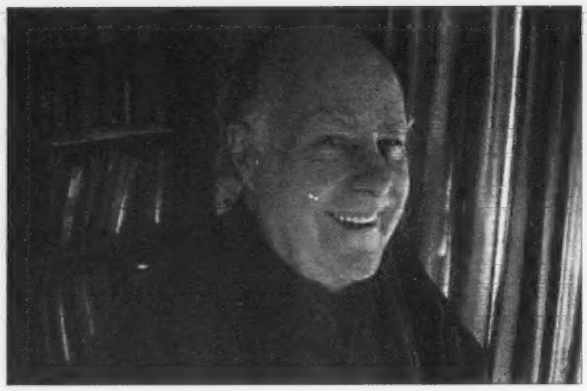

Wise Up & Beat the Odds

NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com
www.waynegreen.com

The Begging Bowl

A letter from the League asking for donations to help protect our frequencies was interesting in that there was no (zero) mention of using the funds for the promotion of the hobby. It was all about defending our frequencies in Washington and at the 2003 World Radio Conference.

Having been a member of the U.S. delegation at such an ITU conference in Geneva, I've had an opportunity to see at first hand how much the League spends at these conferences. The League General Manager had a lavish suite in the most expensive hotel in Geneva. He had several of the League Directors flown over for parties, and this was after the business of the conference no longer involved amateur radio. He spared no expense.

The ITU hams complained to me that they had to throw him out of meetings because he arrived drunk and had brought along a prostitute.

The best way for us to preserve our frequencies is to use them — and that means we need to replace amateurs who have died or become inactive with new blood. Preferably youngsters.

If you want to sell any product the public has to be aware that it exists. To generate awareness of amateur radio we need visibility — and one gets visibility through promotion. We need articles in the newspapers and in the national magazines. We need to have hams with the ability to sell the hobby on thousands of radio and TV talk shows.

People need repeated exposure to something new before they'll make an effort to follow it up.

We have hams working in radio, TV, movies and other media who could be encouraged to help promote the hobby. We need hams to be written into scripts.

Every time a ham or club does something outstanding our PR guns should be blasting away mercilessly. Getting PR is easy when you know how and bother to take the trouble. I've produced a $40 video which explains, step by step, how to get PR into magazines and newspapers.

When your director shows up at a club meeting put the screws to him for not pushing the League to mount a PR campaign aimed at getting us more young hams. If he hasn't been showing up at your club ask him why. That's a big part of his job. He's *your* director. He's supposed to represent you and your club.

The next time you get a begging bowl letter from HQ that doesn't mention a major PR effort to keep the hobby from slowly dying send them a penny instead of $1,000. A penny for their thoughts on not bothering to promote the hobby. We are in desperate need of a hobby lobby.

Now, that World Conference. Has anyone at HQ done *any* homework on this? Which country conference position papers in some way threaten our ham bands? Okay, have we then bothered to send a representative to that country to discuss their position, or are we going to wait until the conference, by which time it will be too late for them to change their position? As far as I know the League has not one representative doing this international lobbying work.

These are the kinds of things that our only national organization should be doing. It's up to you to get the HQ gang off the Newington golf course and into action so they won't be out of work in a few years.

Pole Shift

Scientists have been perplexed by the recent shifting of the Earth's magnetic poles. They're wandering. Substantially. Is it due to the recent weird solar activity? Or what? Yes, of course, I think I have the answer.

If you've read René's *Last Skeptic of Science* (see the Radio Bookshop ad, page 63), you're aware that he proposes that the Earth's magnetic field is caused by the ocean currents, which are slowly circling the Earth. Well, it makes sense, according to the right-hand law: When an electric current moves in the directions of your fingers, of your fist, your thumb will be the north pole of the resulting magnetic field.

So we have a saltwater conductor slowly rotating around the globe and the resulting magnetic field being generated. But why should that field move around?

While listening to Art Bell talk about the melting Antarctic ice field, which is all fresh water, he mentioned that this was disturbing the saltwater currents. Zap! There's the answer. Adding billions of tons of fresh water to the ocean is obviously going to perturb the current flow, and thus the magnetic field it generates.

I'll bet someone with a good computer could predict the pole movements just from estimating the quantity of ice being melted where.

Oh, in case you fell for the Earth as a magnet with an iron core baloney, be advised that the core is molten and iron cannot be magnetized above a certain temperature.

The Crop Enigma

Though you don't read about 'em in *Time*, or see anything about 'em on the evening news, those pesky crop patterns have been around and unexplainable for over 30 years. They've been appearing almost every day over that time, in crops, in snow, on ice, and in sand.

No, they're not being made by two old British farmers. They've appeared in over 50 countries, though the crop patterns are the most prevalent in the English fields.

If you check out sites such as [cropcircleconnector.com] you can see some of the fantastic patterns that have been laid down, all within a few minutes, and none showing any sign of footprints around them, and in a way that no one has been able to duplicate.

The most amazing one, which I've mentioned before, was a close reproduction of a transmission years ago from

Continued on page 7

Big Savings on Radio Scanners

Uniden® SCANNERS

NEW!

Bearcat® 780XLT Trunk Tracker III

Mfg. suggested list price $529.95

Less -$190 Instant Rebate / Special $339.95

500 Channels • 10 banks • CTCSS/DCS • S Meter

Size: 7 5/8" Wide x 6 15/16" Deep x 2 13/16" High

Frequency Coverage: 25.0000-512.0000 MHz., 806.000-823.9875MHz., 849.0125-868.9875 MHz., 894.0125-1300.000 MHz.

The Bearcat 780XLT has 500 channels and the widest frequency coverage of any Bearcat scanner ever. Packed with features such as Trunktracker III to cover EDACS, Motorola and EF Johnson systems, control channel only mode to allow you to automatically trunk certain systems by simply programming the control channel, S.A.M.E. weather alert, full-frequency display & backlit controls, built-in CTCSS/DCS to assign analog and digital subaudible tone codes to a specific frequency in memory, PC Control with RS232 port, Beep Alert, Record function, VFO control, menu-driven design, total channel control and much more. Our CEI package deal includes telescopic antenna, AC adapter, cigarette lighter cord, DC cord, mobile mounting bracket with screws, owner's manual, trunking frequency guide and one-year limited Uniden factory warranty. For maximum scanning enjoyment, order magnetic mount antenna part number ANTMMBNC for $29.95; The BC780XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. For fastest delivery, order on-line at www.usascan.com.

Bearcat® 895XLT Trunk Tracker

Mfg. suggested list price $499.95

Less -$320 Instant Rebate / Special $179.95

300 Channels • 10 banks • Built-in CTCSS • S Meter

Size: 10 1/2" Wide x 7 1/2" Deep x 3 3/8" High

Frequency Coverage: 29.000-54.000 MHz., 108.000-174 MHz., 216.000-512.000 MHz., 806.000-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

The Bearcat 895XLT is superb for intercepting trunked communications transmissions with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer-control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified bank(s). Auto Recording - Lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: PS001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; PS002 DC power cord - enables permanent operation from your vehicle's fuse box $14.95; MB001 Mobile mounting bracket $14.95; EX711 External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems.

Bearcat® 245XLT Trunk Tracker II

Mfg. suggested list price $429.95/**CEI price $189.95**

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10 Priority Channels • Programmed Service Search
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Our Bearcat TrunkTracker BC245XLT, is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as Multi-Track - Track more than one trunking system at a time and scan conventional and trunked systems at the same time. 300 Channels - Program one frequency into each channel. 12 Bands, 10 Banks - Includes 12 bands, with Aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. Smart Scanner - Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. Turbo Search - Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. 10 Priority Channels - You can assign one priority channel in each bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. Preprogrammed Service (SVC) Search - Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - An LCD light remains on for 15 seconds when the back light key is pressed. Autolight - Automatically turns the backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Order on-line at www.usascan.com for quick delivery.

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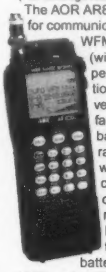

The AOR AR8200 Mark IIB is the ideal handheld radio scanner for communications professionals. It features all mode receive: WFM, NFM, SFM (Super Narrow FM), WAM, AM, NAM (wide, standard, narrow AM), USB, LSB & CW. Super narrow FM plus Wide and Narrow AM in addition to the standard modes. The AR8200 also has a versatile multi-function band scope with save trace facility, twin frequency readout with bar signal meter, battery save feature with battery low legend, separate controls for volume and squelch, arrow four way side rocker with separate main tuning dial, configuarable keypad beep/illumination and LCD contrast, write protect and keypad lock, programmable scan and search including LINK, FREE, DELAY, AUDIO, LEVEL, MODE, computer socket fitted for control, clone and record, Flash-ROM no battery required memory, true carrier re-insertion in SSB modes, RF preselection of mid VHF bands, Detachable MW bar aerial. Tuning steps are programmable in multiples of 50 Hz in all modes, 8.33 KHz airband step correctly supported, Step-adjust, frequency offset, AFC, Noise limited & attenuator, Wide and Narrow AM in addition to the standard modes. For maximum scanning pleasure, you can add one of the following optional slot cards to this scanner: CT8200 CTCSS squelch & search decoder $89.95; EM8200 External 4,000 channel backup memory, 160 search banks. $69.95; RU8200 about 20 seconds chip based recording and playback $69.95; TE8200 256 step tone eliminator $59.95. In addition, two leads are available for use with the option socket. CC8200 PC control lead with CD Rom programming software $109.95; CR8200 tape recording lead $59.95. Includes 4 1,000 mAh AA ni-cad batteries, charger, cigar lead, whip aerial, MW bar antenna, belt hook, strap and one year limited AOR warranty. Enter your order now at http://www.usascan.com.

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QRX . . .

continued from page 1

capabilities of each radio service in an emergency, and for radio safety out on the highways or trails.

"I don't see any amateur radio promotions in RV magazines, nor in aviation and marine magazines, nor in law enforcement journals," comments William Alber WA6CAX, a ham radio instructor and reserve airborne public safety officer.

"Our city's Citizens Emergency Response Team (CERT) program encourages a close relationship with licensed amateur operators, plus our CERT members are trained on how to use FRS equipment, scanners, and GMRS radios," adds Ms. Teri Durnall, City of Costa Mesa, CA.

Bob Leef, Public Relations Chairman for REACT International, reminded me that the REACT organization was developed in the 1950s by a radio industry CB equipment manufacturer, Hallicrafters.

On April 5th, during an informal amateur radio industry meeting held in Milwaukee, Wisconsin, hosted by ham radio megadealer Amateur Electronics Supply, a lengthy discussion ensued on how to attract more radio hobbyists to the amateur service. Most all industry members agreed that small ads in selected magazines for RVers, flyers, mariners, and camping enthusiasts would surely bring in leads. An ongoing discussion with the Amateur Radio Relay League confirms no ad trade-out program in place, nor any marketing plan on how to follow up on a lead to their 800 number when someone wants to become a ham radio operator.

The American Association of Radio Enthusiasts (AARE) was thus formed as a nonprofit corporation for the promotion of amateur radio and all emergency communications into different markets, and to provide a conduit for dealers and ALL hobby radio manufacturers to exchange ideas, work together on projects, and help the radio services grow. The amateur radio service might be double the number of hams in the next 5 years with an aggressive marketing program covering a wide range of age brackets, and even a wider range of other recreational hobbies.

"The amateur license will be much easier to obtain next year when the entry-level Technician class test is completely rewritten," adds Julian Frost N3JF, a ham radio instructor who works closely with kids.

"Out go the technical questions about the inner workings of a radio, and in will come test questions written by active ham radio operators to better reflect those subjects that hams need to know to become a good entry-level operator," adds Frost, referring to an announcement by the Amateur Radio Question Pool Committee that the Technician class for July 1, 2003 (next July), will undergo a major rewrite.

The ham industry will also explore the best way to handle incoming inquiries on how to become a ham.

"Right now the leads may come into an 800 number, and the recipient simply gets a single letter with a computer listing of ham clubs, test sites, and a list of ham instructors within a relatively large geographic area. There appears to be no follow-up nor any local ham ambassador to work these leads, and this may be an area where industry might help," adds William Alber, a noted ham instructor.

Members of AARE were chosen to lead the debut year. They represent many facets of the ham radio equipment and accessory market: Ray Novak KC7JPA, ICOM America, president; Rick Ruhl W4PC, of Creative Services Software, vice president; Evelyn Garrison WS7A, representing Alinco, as secretary/treasurer; yours truly (Gordon West WB6NOA), Gordon West Radio School, advisory board of directors; Bob Heil K9EID, Heil Sound, board of directors; Randy Gawtry KØCBH, Timewave Technology, member-at-large.

The AARE Web site is at [http://www.aaregroup.org].

The group will be "the voice" of the manufacturers and dealers in radio, much like the American Radio Relay League is the voice of each ham radio operator.

"We look forward to encompassing all aspects of the amateur radio industry retail dealers, manufacturers, and distributors. This organization will provide an important focal point leading to the growth of the amateur service," said Novak.

It was pointed out in the industry meeting that only a small percentage of entry-level test preparation book buyers ultimately become licensed as a Technician class operator. Next year's complete rewrite of the Technician test question pool may substantially increase the number preparing for the test to ultimately become licensed hams.

The industry will also embrace other radio service industry members to join them to better educate the public and citizens emergency response team volunteers on the importance of ham license and no-license radio equipment, and how to use that equipment in case of a national or local emergency. With the National Weather Service soon to develop a new electronic voice over its 24-hour weather stations, there needs to be more public awareness on all of the safety benefits of a weather receiver in addition to more information about weather alert as well as geographical S.A.M.E. specific area announcements.

Both the industry as well as ALL RADIO USERS are encouraged to look at the AARE Web site to add input to this newly formed group, or to find out how to join this group as part of the radio industry.

Hobby radio enthusiasts may now find it easier than ever to learn about what's new in the Amateur Radio Service. The new industry group, American Association of Radio Enthusiasts, collectively brings over 100 years of ham radio expertise in support of the hobby, as well as support for ham radio use in emergencies.

"Our industry looks forward to encompassing all aspects of the radio industry," comments Ray Novak KC7JPA, president of the American Association of Radio Enthusiasts.

One of the first goals of the amateur radio industry is to develop a stronger and more thorough marketing program directed to ALL radio enthusiasts thinking about joining the ham radio hobby and service.

The industry will develop close ties with popular hobby groups that may wish to add ham radio as an adjunct to their unique pastimes: recreational vehicle travelers; long-range sailors and boaters; scanner and shortwave listeners; missionaries and remote world travelers; Scouts and wilderness hikers; public safety personnel; citizens emergency response teams; and private pilots.

"We have so much good news to tell all these different user groups," comments Evelyn Garrison WS7A, representing Alinco and serving as the industry secretary/treasurer.

"Amateur radio operators are completely rewriting the entry-level Technician class no-code test. Not only is there no knowledge of Morse Code required to earn the Technician license, but the examination next year will focus on radio OPERATING, as opposed to the present test focused on the more technical aspect of ham radio equipment," adds Garrison, well known for her 50 years in ham radio marketing and the big believer of ham recruitment beyond the ads in the industry's own ham magazines.

"Now that the ham radio service was completely restructured in April of 2000, we think anyone involved in hobby radio will want to earn the entry-level Technician test and learn about all that's new with the ham radio service," echoes Rick Ruhl W4PC, of Creative Services Software, serving as AARE vice president. Kids and computers may be his first priority!

The amateur industry group AARE wants to offer all radio enthusiasts an opportunity to let the group know that there is indeed ham radio interest in these other hobby areas. A single toll-free phone call will allow nonhams to receive a free introduction-to-ham-radio package and be counted as a specific interest group thinking of adding ham radio to their hobby. Simply phone 1-800-326-3942, or send E-mail to [wb6noa@arrl.net], and state your principle hobby interest — boating, flying, no-license radio service, etc. This will help the American Association of Radio Enthusiasts focus future promotions. The industry also welcomes any comments on how other radio enthusiasts view the Amateur Radio Service in general.

Again, the AARE Web site is [http://www.aaregroup.org]; radio dealers and manufacturers of radio products may join the organization by contacting Evelyn Garrison at [www.evelyn@aaregroup.org].

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NEVER SAY DIE

continued from page 4

the Arecibo observatory which depicted man and DNA. Only the crop pattern had an alien head and a three-spiraled DNA instead of two.

This beaut was laid down in a field close to a British observatory.

I've always been a big fan of anomalies ... things that science hasn't been able to explain. I loved the books by Frank Edwards and Charles Fort. I'm curious.

Every now and then Art Bell W6OBB has an expert who has studied some weird phenomenon. He has enough of them so I tape the show every night and listen to it while I'm fixing and eating breakfast. He has his guests on during the second hour ... that's about 11:12–11:29 p.m. Pacific time, after the news and commercials. And then again from 11:42 to 11:59. This goes on for a couple hours more. The program is on over 500 stations most nights, so you can pick out the station for the best reception. I do best up here in New Hampshire with WPTH in Philadelphia.

Most guests are able to cover their subject pretty well during the first hour of the show, so often it takes only a half hour of your listening time to come up to speed on remote viewing, artifacts like a 200-million-year-old lump of coal with a gold chain embedded, conversations with the dead, and other fascinating subjects.

The Grim Future

There was an article in the May *Scientific American* about the demise of electronic and computer hobbies. The illustration purported to be of a hamfest. It had one lonely guy by a table of equipment, none of it ham stuff, that I could see.

My first reaction was to check my photo file for the pictures I took from the air of the Dayton HamVention, back when I was welcome there. But then I remembered my pictures of a recent New Hampshire hamfest where the exhibits looked a lot like the one in the article.

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Continued on page 48

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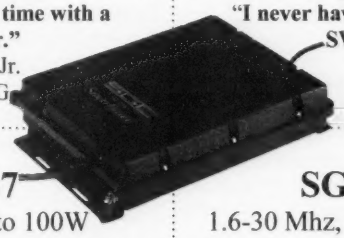

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LETTERS

From the Ham Shack

Bill Pasternak WA6ITF. I wonder if you will be immodest enough to let me share with your readers some thoughts I have, from the perspective of having been involved in ham radio a long, long time.

It seems to me that once again, *73 Magazine* has cheated the "grim reaper of magazine hell" by pulling off a fourth — or is this its fifth? — resurrection. This is not the first such miracle pulled off by its founder, and most believe it will not be the last. Here is the latest installment of the ongoing saga.

A few years ago, most industry sources were betting that *73* would not be around much longer. Major advertisers had pulled out in protest over Wayne Green W2NSD's nonham radio editorials. While the ham business community will never admit it publicly, word is that they wanted Green to get back to his long-running and highly inflammatory tirades against the ARRL and other long-established amateur radio traditions. A year earlier Green had essentially abandoned writing about ham radio; concentrating instead on off-beat science like cold fusion, homeopathic medicine, problems in the nation's educational system, and other esoteric nonham topics. Green made it clear that he had no intention to go back.

For its part, industry looked at Green and *73* as being one and inseparable. To them, advertising in *73* was "buying" Green's glib tongue and anti-ARRL rhetoric. They felt that without his ongoing "League bashing," the magazine would lose its reader base. With advertising money tight for most Pacific-rim companies due to the problems with Japan's economy, something had to go. What went was almost all advertising in *73* by the Japan-based ham radio manufacturers. Those are the baseline ads that comprise almost 80% of all revenues received by all ham radio magazines.

Most believed that it would be only a few months before Green and *73* folded the tent, but they did not reckon with the resourcefulness of Dr. Wayne Sanger Green. Nor did anyone think that Green would again pull the proverbial "rabbit out of his hat" and find a way to save his beloved *73 Magazine*.

Green did find a "magic rabbit." This time it would be in the form of worldwide popularity outside of ham radio that he would gain by appearing as a guest on an overnight talk radio program hosted by another ham. That program is "Coast to Coast AM" with Art Bell.

Bell, who is W6OBB, is the hottest property in the history of overnight talk-radio. He originates his show from a studio in a spare room of his Pahrump, Nevada, home. From there, it's uplinked by a Ku satellite dish in his front yard for the world to hear on their radio receivers and on the Internet using Real Audio streaming. With close to 500 stations broadcasting his show and the backing of the mighty Premiere Radio Network, Art Bell became a household name and Green has literally ridden on his coattails.

Having heard Green's first appearance and most thereafter, it was a match made in heaven. Green has always been very adept at "selling Green." His vast knowledge of such topics as cold fusion, homeopathic medicine, colloidal medicine, and his view of the problems in education make him fit the "Coast to Coast AM" format well.

Dr. Green and host Bell also share something else in common. Both hold high disdain for the American Radio Relay League. They are open in their belief that the ARRL mistake of fostering "Incentive Licensing" has led to the erosion in the hobby we see today. Neither supports the ARRL, and both are outspoken on their alternative views on how to resurrect interest by youngsters in radio and communications technology.

And so it was that W2OBB invited W2NSD to spend five hours with him on "Coast to Coast AM." The next day, the various Internet ham radio newsgroups and other remailers were buzzing with discussions of what Green had said about the ARRL. The controversy he had evoked has yet to die and as a result, hams who had never before heard of Green or *73* were writing checks to subscribe. If he were reading the newsgroups, Green would have known that his latest resurrection had begun.

Green's subsequent appearances on Bell's program have gone a long way toward making him well known outside of ham radio. Most of Bell's estimated ten million nightly listeners are not hams. Green and Bell spend very little time talking Amateur Radio, but the few minutes the two take to bash the politics of the ARRL are more than enough to catch the attention of any ham dialing by. Love him or hate him, they all want to hear more and read more. If a listener is not a *73* subscriber when they tune in, the chances are that a good number of them will be when the sun comes up the next morning. Green is the "penultimate salesman."

Green is again including a bit of his anti-ARRL rhetoric in his editorials. He also regularly targets several other hams whom he seems to believe are detrimental to the survival of the service.

Another change at *73* is more subtle. Except for Green's editorials, *73* has returned almost one-hundred percent to ham radio. It has far more "easy to replicate" construction articles than any other magazine. Many are designed using parts available at any neighborhood Radio Shack store. It also has ample yet easy-to-understand technical articles. Most important, *73* has been able to keep most of its most popular columnists even through the worst of financial times.

While Green is the "idea man" at *73*, its Executive Editor, Jack Burnett, is the "solid thinker" who can get any job done. During his reign at the *73* helm back in the '80s, he became one of the most trusted and well respected members of the Amateur Radio business community. He delivered on every promise and by doing so he gained everyone's admiration and respect. And like the match of Green with Bell on the public relations front, the coupling of Green with Burnett — and others like him — ensures that the quality of *73* will only get better as time goes on.

So, slowly, ever so slowly, advertisers and readers are coming back to *73*. They look to it as an alternative to the ARRL's very conservative politics. It's also looked at as a substitute for other magazines that seem to have no ham radio political view at all. Green and his staff know that their survival depends on having the "ham in the street" as readers and subscribers. They know that the niche exists for a politically motivated magazine that also provides easily replicable and easy-to-construct projects. And that is the road Green is now directing *73* toward in his new masthead title of "El Supremo and Founder."

The only question is, When will the major Pacific-rim ham radio manufacturers return to *73* in force? With Japan's economy still in decline, it could be a long time. They are still cutting back their level of advertising in all other ham radio magazines, including the mainstay *QST*.

But Green does not seem to care. Thanks

Continued on page 56

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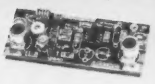

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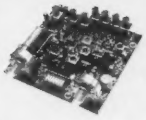

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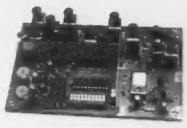

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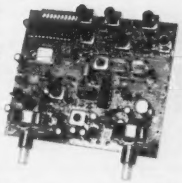

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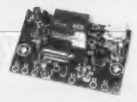

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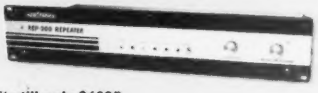

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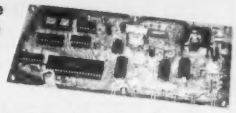

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6m Fun Loop

A low-cost gain antenna for the VHF technician.

Six meters is a good band for experimenters and new hams to try out. Transmitter and receiver circuits are reasonably easy to build without exotic mechanical construction, and antennas are reasonably sized.

A loop antenna is an excellent construction project that can be completed in one afternoon. It will provide gain over a dipole without reducing horizontal coverage. Gain is achieved by reducing the energy that is normally directed vertically from a dipole, and directing it out horizontally where it can do some good. A loop therefore provides about twice as much RF signal as a dipole when transmitting. It also captures twice the signal on receive without increasing thermal noise, improving the received signal-to-noise ratio by a factor of two.

A loop can be round, square, triangular, or rectangular, with only small differences in performance.

Construction details

You will need four wood dowel rods 7/16" by 48" long for the spreaders. These are available at any building supply or hardware store. Mine are poplar, but any hardwood will be satisfactory. You will also need a 5-1/2" square piece of plywood, 3/8" thick. Eight machine screws 6-32 by 1" long with nuts hold the spreaders to the plywood. See **Photo B** for mounting details.

The loop wire is solid copper #14 HF insulated. It is supported by passing through a 1/8" hole in each spreader. The holes are 4-1/2" in from the far end of the 48" spreaders. With this dimension, the loop will resonate

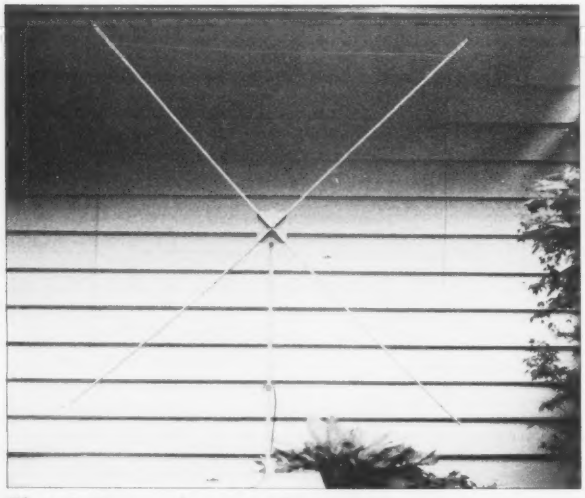

***Photo A.** Six meter loop set up for testing.*

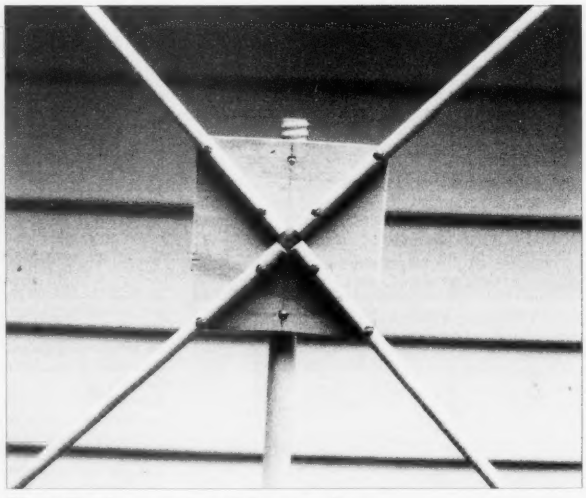

***Photo B.** Close-up view of the spreaders.*

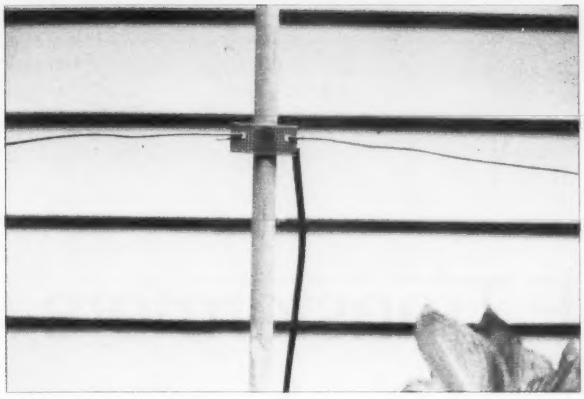

Photo C. Bottom feed insulator.

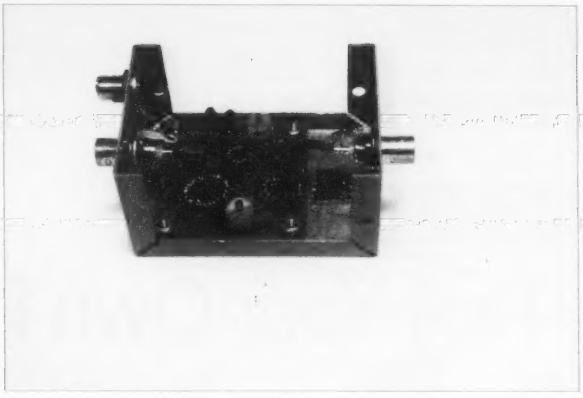

Photo D. Six meter power amplifier — 2 watts.

at 50.2 MHz. For higher frequencies, the loop can be made proportionally shorter by drilling these mounting holes farther in on the spreaders.

For horizontal polarization, the loop is fed at the bottom center using coax cable and a center insulator. See **Photo C**. Note, however, that a loop has an impedance of about 100 ohms at resonance. In order to match this to a 50 ohm coax, a Q-section of 75-ohm coax is used. The Q-section is just a quarter wavelength of RG-59/U coax. I used Radio Shack RG-59/U foam E111378A 42" long. The length is not very critical, as the Q-section will work over a bandwidth wider than the entire 6 meter band. One end of the Q-section coax connects to the loop. Connect the braid to one end of the loop and center conductor to the other loop end. The far end of the Q-section is then connected to a 50-ohm feedline of any length necessary to reach the shack. I used Carol RG-58/U E18621-8 coaxial cable of 25-foot length.

Measurement

The loop antenna has a relatively wide bandwidth. See the measurement results in **Fig. 1**. These were taken with an MFJ-259 SWR Analyzer at the end of the 25-foot feedline. Without a Q-section, the SWR would never drop below 2:1.

Driving the loop on transmit

One nice feature of the 6-meter band is that low-cost power transistors developed for CB transmitters can be used to produce power output on this band. All of the following work well — Motorola MRF476, and Japanese 2SC1306, 2SC1678, 2SC2075, and 2SC2078, producing over 2 watts output at 50 MHz with a 12-volt supply. A power amplifier kit, shown in **Photo D**, is available from Unicorn Electronics, 1 Valley Plaza, Johnson City NY 13790; 1-800-221-9454; [www.unicornelex.com]. 73

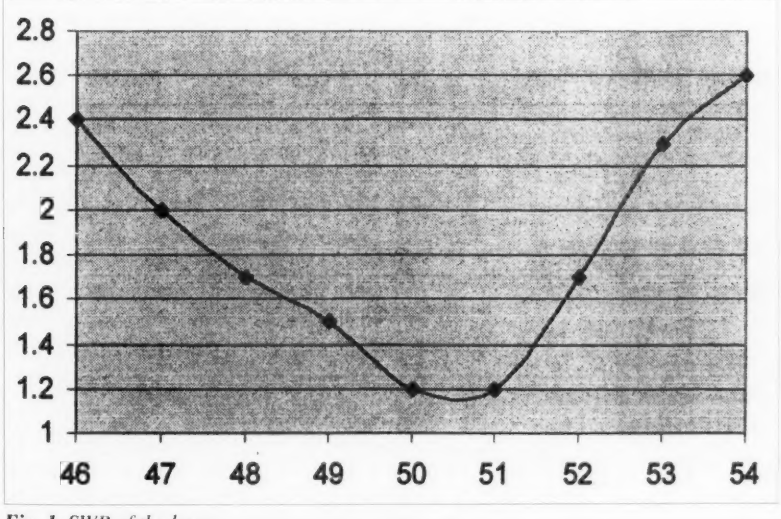

Fig. 1. SWR of the loop.

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Roll Your Own RF Transformers

But don't get TOO wound up in it.

Have you ever looked at a schematic that included a broadband RF transformer and wondered how the author ever determined that it should be 10 turns bifilar-wound of number 32 wire on an T375-43 core? While this article isn't going to make you into a full-fledged radio engineer, with a few simple calculations, you too can design and build your own broadband transformers.

This article will concentrate on low-power designs, suitable for receivers or QRP transmitters. But, similar concepts apply to high-power designs. It considers only "conventional" transformers, not transmission line or balun designs. Jerry Sevick's classic book, *Transmission Line Transformers* (ARRL, 1987), remains the most accessible reference for those interested in transformers using transmission line techniques.

Transmission line transformers should be considered where DC isolation isn't necessary and where the desired transformation ratio can be achieved. If not, then a conventional transformer is required.

Ideal transformers

First, a quick review of "ideal" transformers. An ideal transformer has no losses; all of the power in the primary appears in the secondary. The relationship between the turns ratio N, primary voltage E_{PRI}, secondary voltage E_{SEC}, primary current I_{PRI} and secondary current ISEC are governed by simple relationships:

N = Number of Secondary Turns/ Number of Primary Turns

$$E_{SEC} = N \times E_{PRI}$$

$$I_{SEC} = I_{PRI}/N$$

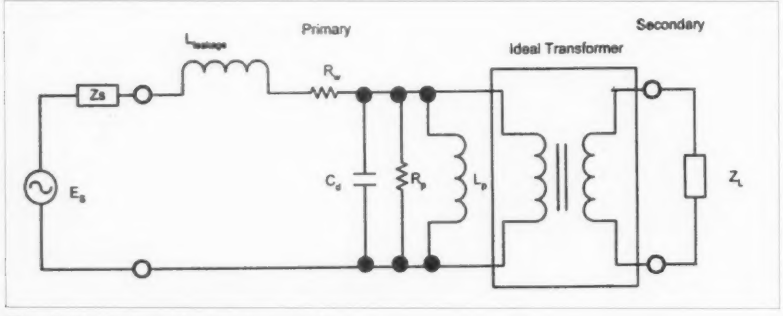

Fig. 1. *Equivalent circuit of a transformer.*

In an AC circuit, impedance Z is the ratio of voltage to current. E, I, and Z are, strictly speaking, complex, and may have both real and imaginary components. We'll simplify things as much as possible and deal chiefly with the magnitude of E, I, and Z.

$$Z_{PRI} = E_{PRI}/I_{PRI}$$

$$Z_{SEC} = E_{SEC}/I_{SEC}$$

$$Z_{PRI} = Z_{SEC}/N^2$$

The last equation is important; a transformer alters impedance by the square of the turns ratio.

Not-so-ideal transformers

Unfortunately, none of my radio parts catalogs has a part number for an "ideal transformer." We instead have to deal with transformers that exhibit leakage inductance, core loss, winding loss, distributed capacitance, and other real-world factors.

One simple yet accurate model of a practical transformer is shown at **Fig. 1**. L_p and R_p are the parallel inductance and resistance of the core, R_w is the winding resistance, C_d is the distributed

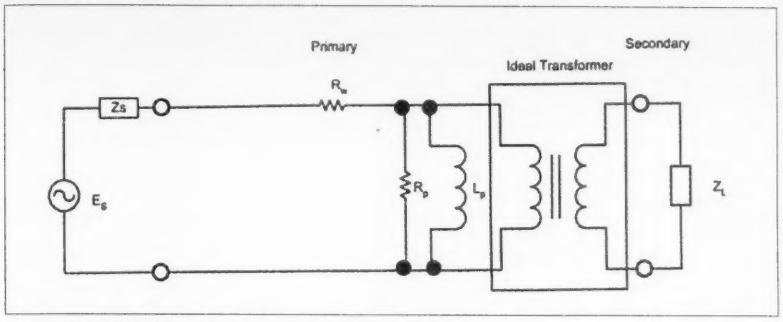

Fig. 2. Simplified low-frequency equivalent circuit.

capacitance, and $L_{leakage}$ is the leakage inductance. Z_S and Z_L are the source and load impedances. Note that all of these parasitic elements are shown in the primary circuit, although, of course, they are also found in the secondary. When necessary, the value of these parasitic elements can be adjusted to represent both primary and secondary loss elements.

We can further simplify **Fig. 1** by separately examining the low- and high-frequency responses. At low frequencies, a well-designed transformer will exhibit small leakage reactance ($2\pi FL_{leakage}$) and thus $L_{leakage}$ can be neglected. Likewise, at high frequencies the primary inductance reactance ($2\pi FL_p$) is large and L_p can be neglected. **Figs. 2** and **3** show the simplified low- and high-frequency models.

What then determines the low- and high-frequency performance of our real-world transformer? Looking at **Fig. 2**, we see that we want low R_w and high R_p and L_p. For high frequency, we again want low R_w and high L_p, but we also need low $L_{leakage}$ and low C_d. In fact, if $L_{leakage}$ and C_d in **Fig. 3** remind you of a low-pass filter, you're right. It is a low-pass filter.

Design methodology

Our design objective is to pick a core material providing an acceptable R_p, and windings that meet the R_w and L_p objectives. $L_{leakage}$ and C_d are tough to explicitly design for as they depend mostly on the configuration of the windings. Hence, for the purpose of our simplified design approach the high-frequency response is pretty much what you get.

We will use an example of a wideband transformer to match 50 ohms to 300 ohms, with a response no worse than 3 dB down over a frequency range of 3–30 MHz. This transformer might be used, for example, to connect a vintage tube-type shortwave receiver with a 300-ohm balanced antenna input to a 50-ohm coaxial fed antenna.

Here's a step-by-step approach to meeting these objectives:

1. Calculate L_p, given F_L, the desired low-frequency cutoff point in MHz, and Z_S, the primary source impedance. Use **Table 1.**

• If the transformer matches 50 ohms

Continued on page 14

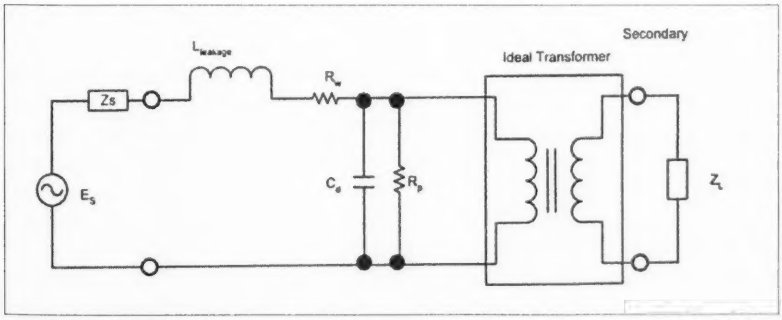

Fig. 3. Simplified high-frequency equivalent circuit.

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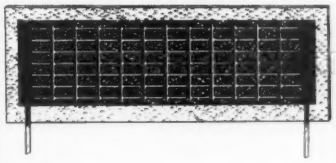

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Low-Frequency Loss (dB)	Constant k_1	Constant k_2
0.5	0.227	11.4
1	0.156	7.8
2	0.104	5.2
3	0.080	4.0

Table 1. *Calculating L_p. For the more mathematically inclined,* ***Table 1*** *is derived from the following equation:* $L_p \geq \frac{R}{\omega}\sqrt{\frac{1}{10^{I.L.}-1}}$, *where* $\omega = 2pF$, *I.L. = insertion loss in dB, and R is the parallel combination of the source resistance R_S and the load resistance R_L, with R_L's value reflected back to the primary side. In the normal case, $R_S = R_L$ after reflection; hence $R = R_S/2$.*

Roll Your Own RF Transformers

continued from page 13

to another impedance, you can use the simplified formula: $L_p \geq k_2/F_L$.

L_p is the minimum inductance in µH, and F_L is the low-frequency response frequency in MHz. Select k_2 from **Table 1** depending upon the rolloff you desire at the low-frequency cutoff point. (The calculations behind **Table 1** ignore R_p, so the actual losses will exceed those predicted; hence we will design for a 2 dB loss to ensure that we meet our 3 dB target.)

In our sample design, we want not more than 3 dB loss at 3 MHz. To provide a bit of a safety margin, we will use $k_2 = 5.2$, corresponding to 2 dB loss.

$$Lp \geq 5.20/3 \geq 1.73\ \mu H$$

• If the transformer matches non-50-ohm source impedance R_S, use k_1 from **Table 1**.

Mfr.	HF Core Material & μ_r	VHF Core Material & μ_r
Fair-Rite	Type 43, μ_i = 850	Type 61, μ_i = 125
Ferronics, Inc.	Type J, μ_i = 850	Type K, μ_i = 125

Table 2. *Commercial identifiers of suitable ferrite mixes from two widely available manufacturers.*

						A_L (nH)	
Fair-Rite P/N	OD (in.)	ID (in.)	Thick (in.)	l_e (cm)	A_e (cm²)	Type 43	Type 61
5943000801	0.155	0.088	0.050	0.92	0.011	96	N/A
5943002101	0.190	0.090	0.050	1.04	0.015	128	N/A
59XX000101	0.230	0.120	0.060	1.30	0.020	132	25
59XX000201	0.375	0.187	0.128	2.07	0.072	300	55
59XX000301	0.500	0.281	0.188	2.95	0.129	375	69
59XX001101	0.500	0.312	0.250	3.12	0.150	410	65
59XX001901	0.500	0.312	0.500	3.12	0.299	820	150
5943005101	0.630	0.378	0.182	3.85	0.145	320	N/A
59XX004901	0.630	0.378	0.250	3.85	0.199	440	80
59XX000501	0.825	0.520	0.468	5.20	0.460	750	135
59XX001801	0.870	0.540	0.250	5.40	0.262	410	75
5943007601	0.870	0.540	0.500	5.40	0.520	820	N/A
5943001301	1.000	0.610	0.250	6.20	0.308	425	N/A
5943001401	1.000	0.610	0.320	6.20	0.410	560	N/A
XX = either 43 or 61							

Table 3. *Ferrite core properties (Fair-Rite).*

$$Lp \geq R_S k_1/F_L$$

For example, if our transformer is to match 75 ohms to 300 ohms with no more than 3 dB loss at 10 MHz, what is the minimum L_p? (Again, for a safety margin we will use $k_1 = 0.104$, corresponding to 2 dB loss.)

$$L_p \geq (0.104 \times 75)/10 \geq 0.78\ \mu H$$

2. Calculate the turns ratio, given Z_S and Z_L. The turns ratio is determined by the ideal transformer equation.

$$N^2 = Z_L/Z_S, \text{ or}$$

$$N = \sqrt{\frac{Z_L}{Z_S}}$$

Substituting values for our 50 ohm to 300 ohm transformer, we calculate N:

$$N = \sqrt{\frac{300}{50}} = \sqrt{6.00} = 2.45$$

Since N is not an integer, we cannot easily use a multifilar winding approach.

3. Preliminary considerations in selecting the core and calculating the number of turns. For a variety of reasons, including self-shielding properties and wide availability, we will consider only toroid core forms.

Here's where some judgment comes in. For broadband transformers in the HF range, experience shows a core with a relative permeability (μ_r) of 800–1,000 works well for HF, and that a relative permeability of 100–150 is suitable for VHF. **Table 2** shows the commercial identifiers of suitable ferrite mixes from two widely available manufacturers.

Since our target is for 3–30 MHz, we decide, therefore, to use Fair-Rite Type 43 material.

Next, we wish to select the physical core size. Since we are only considering receive-only or very-low-power transmit applications, our core selection will not be driven by power dissipation concerns. Rather, we must balance the following considerations:

• To keep R_w down, we should use the largest practicable wire size. The larger the core, the larger the wire size. Fortunately, for practical transformers working with impedances of a few hundred ohms, R_w isn't a critical factor for any practical wire size.

• In a toroid transformer, leakage inductance in µH is *approximated* by

Fair-Rite P/N	Turns 43 Material	Turns 61 Material
5943000801	4.25	N/A
5943002101	3.68	N/A
59XX000101	3.62	8.32
59XX000201	2.40	5.61
59XX000301	2.15	5.01
59XX001101	2.05	5.16
59XX001901	1.45	3.40
5943005101	2.33	N/A
59XX004901	1.98	4.65
59XX000501	1.52	3.58
59XX001801	2.05	4.80
5943007601	1.45	N/A
5943001301	2.02	N/A
5943001401	1.76	N/A
XX = either 43 or 61		

Table 4. Number of turns to yield 1.73 µH.

the formula

$$L_{leakage} \approx 292N^2 \frac{1.065A_e}{\ell_e}$$

where A_e and ℓ_e are determined from the physical size of the core. A_e is the effective cross-section of the core in cm^2 and ℓ_e is the effective path length in cm (this is approximately the mean circumference of the core). Both A_e and ℓ_e are tabulated by the core manufacturers. To keep $L_{leakage}$ down, we should keep N as small as possible and pick a core with a small A_e but large ℓ_e.

• The larger the core, the greater the cost and the greater the space required on the circuit board.

• Our target has a turns ratio of 2.45:1. Since you can't wind a fractional turn, if we only have a few primary turns we may be unable to accurately achieve our desired turns ratio. In our example with N = 2.45, should the primary require 3 turns, the secondary must have 7.348 turns. Since we can only wind 7 turns or 8 turns on the secondary, our achievable N then becomes either 2.33 or 2.67. Instead of transforming 50 ohms into 300 ohms, we would instead have 272 ohms (7 turns) or 355 ohms (8 turns). Whether this deviation is important or not depends upon the application. The larger the core, the fewer the turns required to meet a specific L_p target. Therefore, a smaller core will give greater turns ratio flexibility.

• The smaller the core, generally speaking, the better the high-frequency response holds up.

4. Selecting the core and calculating

Primary Turns	Secondary Turns	ZL	Error from 300 Ohms
2	4	200	33%
2	5	313	–4%
2	6	450	–50%
3	6	200	33%
3	7	272	9%
3	8	356	–19%

Table 5. Possible designs.

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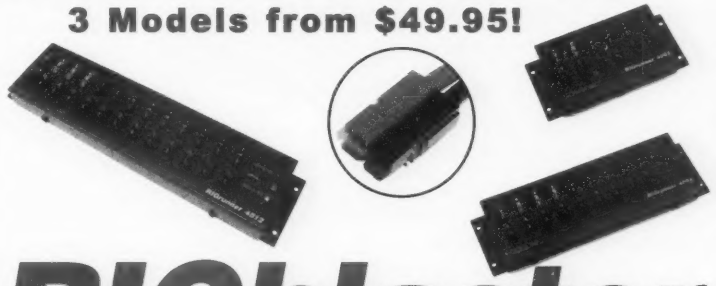
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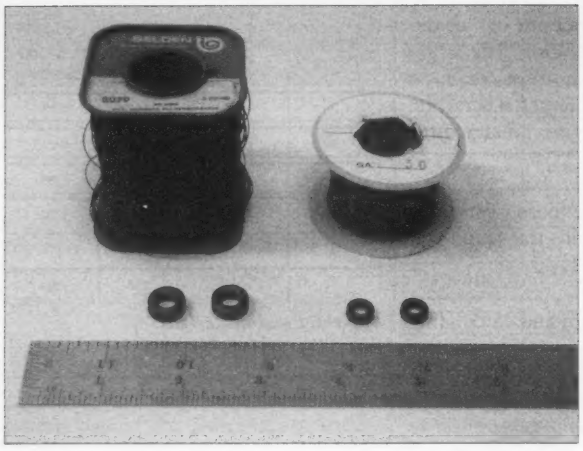

Photo A. *Ingredients for winding a transformer — wire and ferrite cores.*

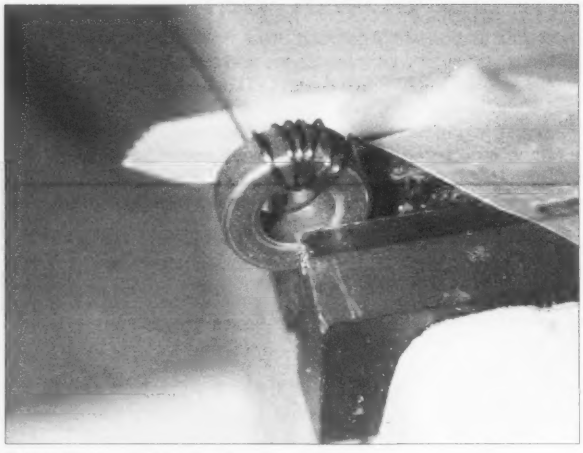

Photo B. *Partially wound transformer.*

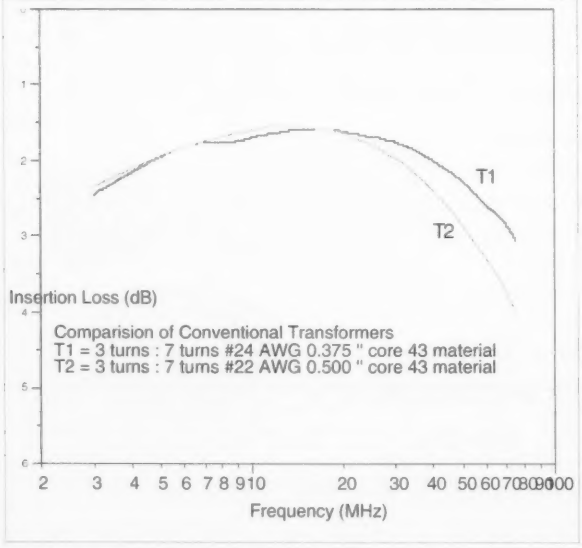
T1
T2
Insertion Loss (dB)
Comparision of Conventional Transformers
T1 = 3 turns : 7 turns #24 AWG 0.375 " core 43 material
T2 = 3 turns : 7 turns #22 AWG 0.500 " core 43 material
2 3 4 5 6 7 8 9 10 20 30 40 50 60 70 80 90 100
Frequency (MHz)

Fig. 4. *Frequency response of 50:300 ohm transformers for 3/8-inch and 1/2-inch core diameter.*

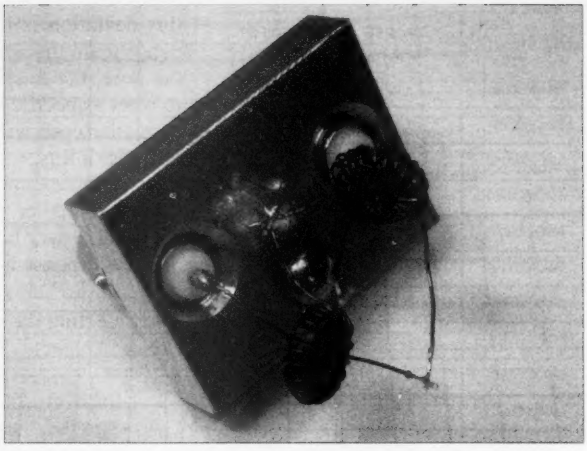

Photo C. *Two transformers wound and connected back-to-back for loss measurements.*

number of turns. Let's calculate a few possible configurations. This task is simplified if a spreadsheet program, such as Microsoft Excel, is used. I've reproduced the characteristics of a selection of Fair-Rite cores in **Table 3**. (Since we are dealing with receive or low-power operations, I've only shown cores up to 1 inch in diameter.)

Given an A_L value, the following formula determines the number of turns required to yield a particular inductance, where L is in µH:

$$N = \sqrt{\frac{L \times 1000}{A_L}}$$

For our required 1.73 µH, and for a 5943000201 core, with AL = 300 we can calculate the number of primary turns required:

$$N_{PRI} = \sqrt{\frac{1.73 \times 1000}{300}} = \sqrt{5.76} = 2.40 \text{ turns}$$

Table 4 shows the same calculation for all the possible combinations that yield 1.73 µH.

My junkbox yielded both the -0201 and -0301 cores, so let's look at those in more detail. Both require 2 and a fraction turns. We can't wind a fractional turn, and our calculation yields a minimum inductance, so we should consider 2 or 3 primary turns.

We can then calculate the Z_L possible with 2 or 3 primary turns, as shown in **Table 5.**

A 2-turn primary would be risky, since we determined that more than 2 turns was the minimum requirement. We want to keep the number of turns as low as feasible to preserve the high-frequency response. Hence, our design will use 3 primary turns and 7 secondary turns with a theoretical error of only 9% from the desired 50:300 ohm transformation. The core will therefore have a total of 3 primary + 7 secondary = 10 turns.

Deciding between a –201 and –301 core is a less critical choice. On one hand, the smaller core should provide better high-frequency performance, since the windings are smaller and will exhibit less C_d. On the other hand, we will see slightly less loss with the larger core.

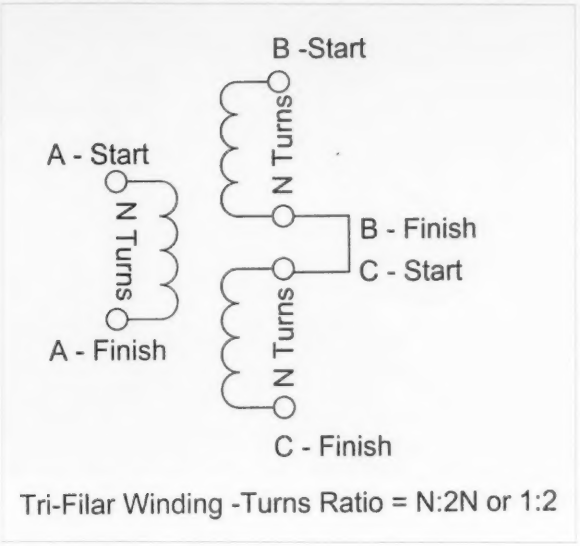

Fig. 5. Connections in trifilar transformer.

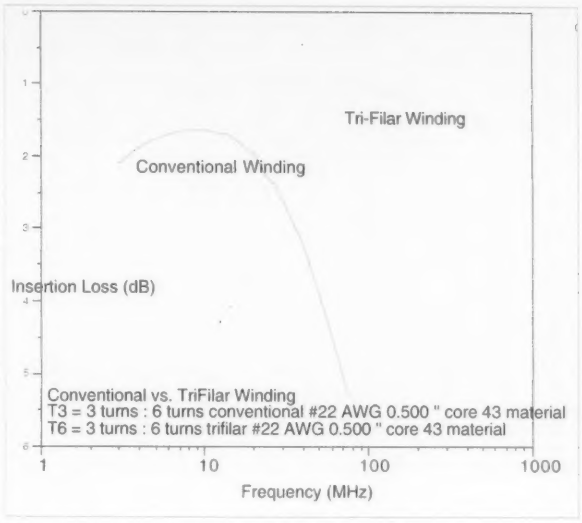
Tri-Filar Winding
Conventional Winding
Insertion Loss (dB)
Conventional vs. TriFilar Winding
T3 = 3 turns : 6 turns conventional #22 AWG 0.500 " core 43 material
T6 = 3 turns : 6 turns trifilar #22 AWG 0.500 " core 43 material
1
10
100
1000
Frequency (MHz)

Fig. 6. Frequency response for 50:200 ohm transformers, conventional versus trifilar-wound.

A good rule of thumb is that windings should occupy about 75% of the core circumference. The inner diameter is the limiting factor if we wish to avoid wire overlap. (Overlap increases C_d and therefore hurts high-frequency response.)

The inner diameter of the –201 core is 0.187 inches, which yields a circumference of 0.294 inches [circumference = (π x diameter)/2]. 75% of this length is 0.220 inches. This means that the maximum wire diameter is 0.220 ÷ 10 turns = 0.022 inches, corresponding to #23 AWG (#22 or #24 wire would be suitable). Performing the same calculations for the –301 core gives a maximum wire size of #20 AWG.

Thus, our two candidate transformers T1 and T2 are:

• T1: 3 primary turns of #24 AWG and 7 secondary turns of #24 AWG on a 0.375-in. diameter toroid core using FairRite 43 material.

• T2: 3 primary turns of #22 AWG and 7 secondary turns of #22 AWG on a 0.500-in. diameter toroid core using FairRite 43 material.

Let's see how these paper designs perform.

Test results

We will measure the "insertion loss" of T1 and T2. The insertion loss compares the load power available with the transformer in the circuit versus the load power with the transformer out of the circuit. Insertion loss consists of both true transformer loss (core loss and winding loss) and mismatch loss caused by the transformer impedance not matching the source or load impedances. Both losses are commonly combined and referred to as the insertion loss.

While it's possible to measure the insertion loss and frequency response of a single transformer, accurately measuring power at two impedance levels — 50 ohms and 300 ohms in our design example — is tricky. Almost all RF test equipment is based on 50 ohms, so our job is easier if both the source and load impedance can be made to look like 50 ohms. The simple solution is to wind two identical transformers and couple them back-to-back, thus yielding 50 ohms source and load. In this case, of course, the loss of each individual transformer is one half of the total loss.

I wound two identical transformers on –201 cores with 3 primary and 7 secondary turns (T1), and two on –301 cores (T2). I then connected these back-to-back and ran a series of insertion loss measurements using a Hewlett-Packard 8754A scalar network analyzer. **Photo C** shows the simple test fixture I made to hold the transformers. As can be seen from **Fig. 4,** either design meets our requirements, although the physically

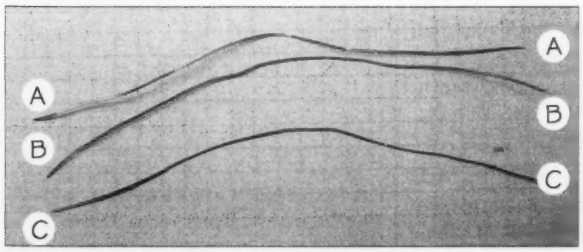

***Photo D.** To make a trifilar winding, measure three equal lengths of wire.*

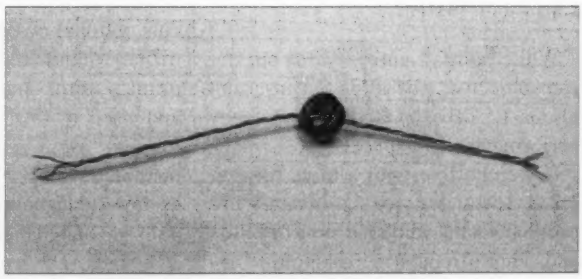

***Photo E.** Twist the three wires together and wind the transformer.*

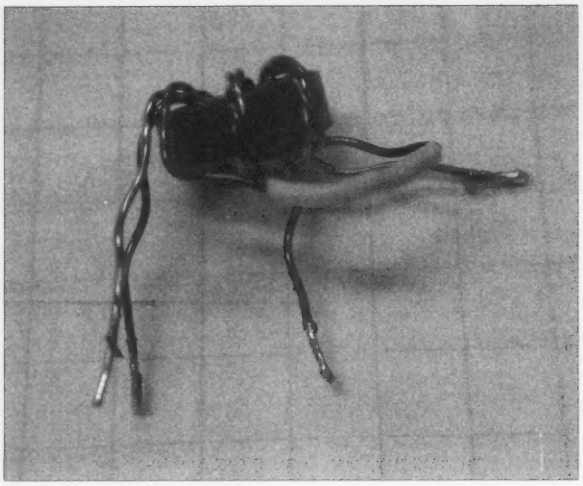

Photo F. *Completed transformer.*

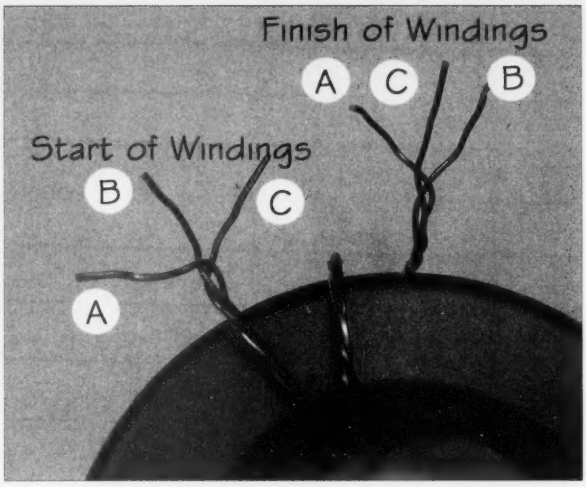

Photo G. *Trifilar ends before connection.*

smaller T1 offers slightly better high-frequency performance.

If we put a 300-ohm resistor across the secondary winding of our transformer, we should expect the primary to measure 50 ohms impedance, right? If we had a perfect transformer, this is exactly what we would see. However, our transformer model predicts that we will see something other than 50 ohms. The "ideal transformer" part of our model changes the 300-ohm load into 50 ohms. The load resistance, however, is in parallel with R_p and L_p and is in series with R_w and $L_{leakage}$. Thus, we would expect to see less than 50 ohms, and we expect a series inductance component. In fact, at 10 MHz, with a 300-ohm resistor across the secondary, I measured the primary impedance Z_{in} as 34 +j17 ohms. This value is in excellent agreement with calculated results based upon the transformer equivalent circuit parameters I measured at 10 MHz: $L_{leakage}$ = 0.119 µH, R_w = 0.25 ohms, L_p = 2.23 µH, and R_p = 160 ohms. C_d is about 2 pF.

Can we do better?

While both T1 and T2 meet our design objective, the midband insertion loss is 1.5 dB, and the high-frequency performance isn't spectacular.

If we can live with a turns ratio of 1:2, 1:3, etc., we can significantly improve both the midband insertion loss and high-frequency response by multifilar winding. Multifilar is a $10 word that simply means that wires comprising the winding are paralleled before winding. In practice, the wires are twisted together to form a single strand and the strand is then wound through the core. Since the primary and secondary windings are wound in parallel, each strand must have the same number of turns. Thus, the turns ratio is defined by the number of strands in the multifilar winding. If we have two strands (one primary and one secondary), the turns ratio is 1:1; if we have three strands (one primary and two secondary), the turns ratio is 1:2 — and so forth. The secondary strands are then connected in series, as illustrated in **Fig. 5**. (It is possible to tap a multifilar winding to yield a fractional turn, and this technique, although mechanically inconvenient, should be considered where necessary.) **Photos D** through **H** illustrate the steps in winding a multifilar transformer.

To investigate the degree to which a multifilar winding improves transformer performance, I wound two pairs of 1:2 transformers, one pair with conventional windings and one pair trifilar-wound. All transformers had 3 primary turns and 6 secondary turns and used a –301 core. These transformers were designed using the method developed earlier, with 3 MHz as low-frequency response target but with an impedance ratio of 50 ohms: 200 ohms. The trifilar winding used 3 strands of #22 AWG magnet wire, twisted together tightly, around 15-turns-per-inch-wound.

I tested the insertion loss using the same back-to-back method described earlier. Although I knew that the trifilar-wound transformer would outperform the conventional winding, I didn't expect the difference to be so marked. The 3 dB bandwidth of the conventional transformer extended to 35 MHz; the trifilar transformer frequency response extended to over 600 MHz. The midband insertion loss also improved from 1.6 dB to 0.9 dB.

DC current in a winding

The procedures I've discussed can be applied directly if the transformer windings don't carry DC current. In some applications, however, DC is carried in one or more of the transformer windings — for example, where the transformer is in the collector circuit of a transistor.

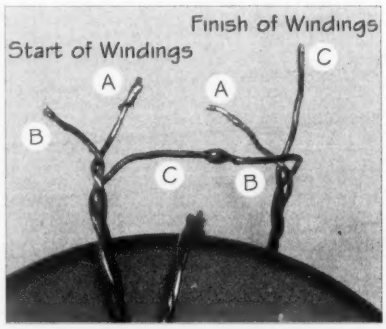

Photo H. *How to connect the trifilar windings.*

The DC current, if sufficiently large, will saturate the core and reduce the effective inductance of the windings. It can also cause nonlinear operation. The usual recommendation is to use a core with a small air gap, but air-gapped cores are not readily available to the experimenter. In the absence of a gapped core, the builder should use a physically larger nongapped core and increase the number of turns. References 2 and 3 should be consulted for further information if significant DC currents are to be carried in a transformer. With practical-size cores, a few milliamperes in the primary won't significantly change transformer performance.

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3. M.F. "Doug" DeMaw, *Ferromagnetic Core Design & Application Handbook,* MFJ Publishing, Starkville, MS (1st ed., 1996).

4. Technical Note TN69, Midcom, Inc., available over the Internet at [http://www.midcom-inc.com/pdf/TN69.pdf].

5. Ferroxcube, *Data Handbook Soft Ferrites and Accessories,* available over the Internet at [http://www.ferroxcube.com/]. See also *The Use of Ferrite Cores in DSL Wideband Transformers,* also available from Ferroxcube's Web site. 73

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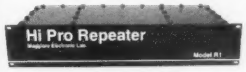

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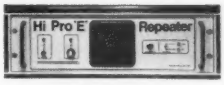

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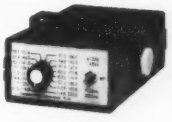

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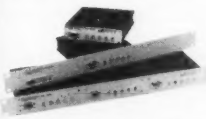

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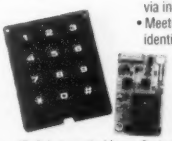

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Now, let's consider the assembly. Originally I used wire-wrap technology to do the prototype. It worked out very well for me. FAR Circuits offered to do the printed circuit board and offer it for sale to the builder, so I am listing FAR Circuits as a possible source of a PC board set. This article uses wire-wrap

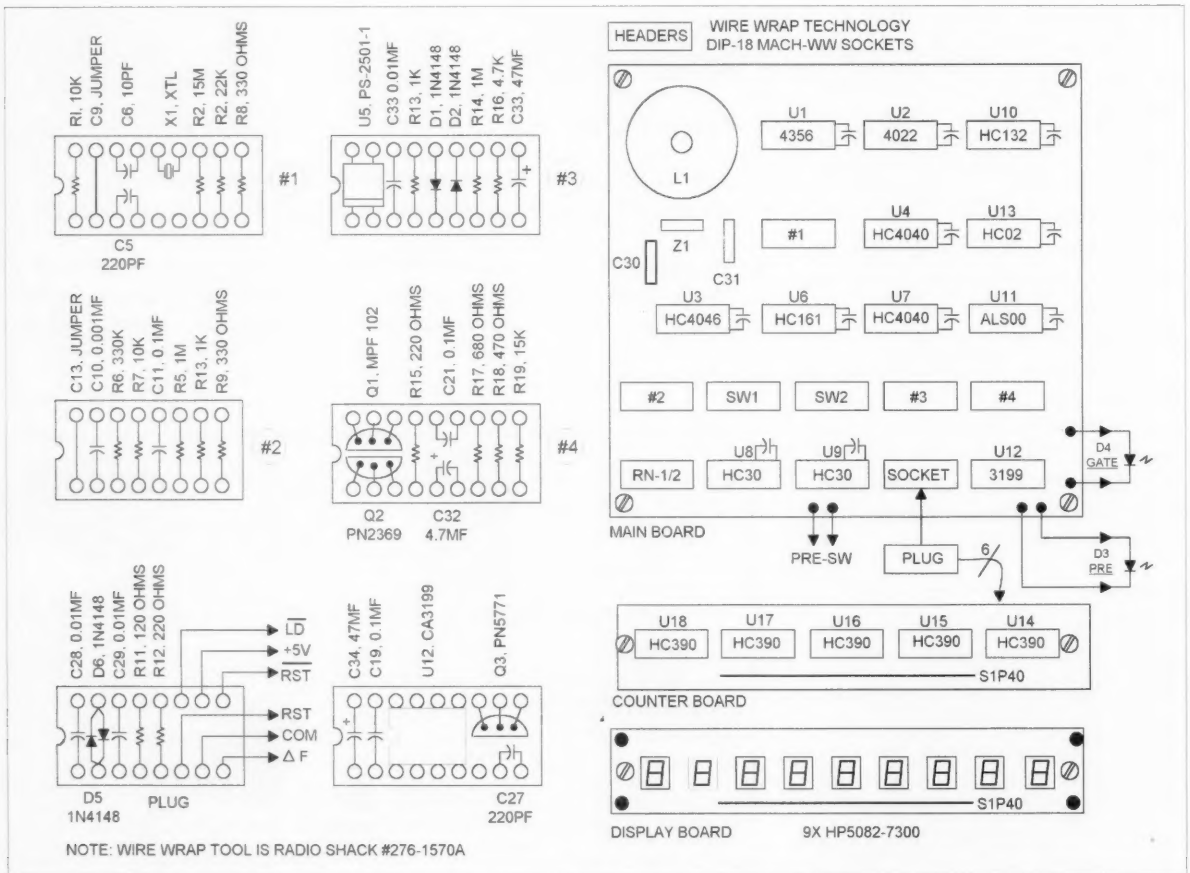

Fig. 6. *Notes: (1) If wire-wrap technology is used, then DIP-18 WW sockets must be used to allow the 0.1 µF capacitors to be inserted between pins 9 and 10 of the socket (pins 8 and 9 of DIP-14). (2) If DIP sockets with 0.1 µF caps between pins 16 and 8 Vdd, Vss (DIP-14 = 14 and 7) are used, then no 18-pin sockets are needed. (3) In this article, MF in schematics is meant to indicate µF.*

Parts List — part 1

Qty.	ID	Description	P/N	Vendor
2	SW1, SW2	8-pos (DIP16) DIP switches	38842	1
1	ENC	Enclosure Ten-Tec model JW7	JW6	3
1	PCB	PC board set (3 boards)	K8IHQ	6
1	Alt-PCB	PC perforated board CEM	574-169P44	2
1	WC	6 VDC 800 mA (reg.) wall converter	56-586	5
1	P1	DIP16 (machine pin) ST socket (plug)	37401	1
7		DIP16 WW (mach. pin) socket	21-220	5
16		DIP18 WW (mach. pin) socket	21-180	5
3	SO1–SO3	DIP24 WW (mach. pin) socket (LEDs)	21-184	5
1	X1	32768 Hz quartz watch crystal	X801	4
2	S1, S2	DPDT (2-pos.) sub-mini toggle switch	75977	1
1	U1	4536 CMOS IC (DIP16)	511-4536	2
1	U2	4022 CMOS IC (DIP16)	511-4022	2
1	U3	74HC4046 CMOS IC (DIP16)	45938	1
2	U4, U7	74HC4040 CMOS IC (DIP16)	45920	1
1	U5	PS-2501-1 optocoupler (DIP4)	551-PS2501-1	2
1	U6	74HC161 CMOS IC (DIP16)	45452	1
2	U8, U9	74HC30 CMOS IC (DIP14)	45786	1
1	U10	74HC132 CMOS IC (DIP16)	45321	1
1	U11	74ALS00 ALS IC (DIP14)	605-74ALS00AN	2
1	U12	CA-3199-E IC (DIP8) prescaler	—	8
1	Alt-U12	UPB-1509-GV (NEC) (SO-8) MMIC	UPB-1509-GV	4
1	U13	74HC02 CMOS IC (DIP14)	45188	1
1	U14	74F160 IC (BCD) (DIP16)	74F160APC	4
4	U15–U18	74HC390 CMOS IC (DIP16)	511-M74HC390	2
1	Q1	MPF102 (2N5486) JFET (TO-92)	26403	1
1	Q2	2N2369A NPN transistor (TO-92)	610-PN2369A	2
1	Q3	2N5771 PNP transistor (TO-92)	RSU-11416229	7
4	D1, D2, D5, D6	1N4148 silicon SW diodes	36038	1
1	D3	Prescale LED (T-1) 3mm green	25-302	5
1	D4	Gate LED (T-1) 3mm yellow	25-285	5
9	DS1–DS9	7-seg. LED displays 0.3 in. red (HP-5082-7300)	173833	1
1	BZ	PMI black bezel (3.6 in.)	PRD-360-B	4
1	BZ	PMI red bezel (3.6 in.)	PRD-360-R	4
1	BZ	PMI clear masked lens (3.6 in.)	PRD-360-W1	4
1	—	0.25 in. grommet	64-3025	7
4	—	0.25 in. 4-40 standoff hardware	133639	1
6	—	0.5 in. 4-40 nylon standoffs and screws	28-145	5

Table 1. *Parts list.*

technology. I do recommend the PCB, since this is a fairly complex instrument which allows plenty of chance for mistakes in the wire-wrap version.

Many of the components are mounted on 18-pin wire-wrap sockets used as headers. The headers are then mounted to the circuit board. Details of these headers are provided in **Fig. 6**. (See part 1 for Figs. 1–5 and Photos A and B.)

The prescaler is either RCA type CA-3199-E (DIP-8) or NEC UPB1509 (SO-8). You will save some work if you can locate the RCA part, because it is an 8-pin DIP and can be inserted directly into its header socket. RCA has discontinued the device, but you may still find it in stock at some vendors.

If you cannot obtain the CA-3199-E, use the NEC UPB1509, which is a surface-mount technology (SMT) device. Glue the device to a DIP-8 machine pin socket, and wire it as shown in **Fig. 7** — easy on the heat! Insert the socket carrying the UPB1509 into its header. There is an order and wait situation for the UPB1509 since they are used in the cellular telephone industry. I waited nearly 60 days for delivery.

Mount the assembled PCB using aluminum 0.25" standoffs and #4 hardware. Ensure that the ground/common is connected to the enclosure (aluminum case) bottom. I hard-wired the wall converter in place. Use a grommet to go through the rear of the enclosure, and tie a knot in the wire inside the enclosure. That should do it! Go slowly and be careful!

Let's get to the details of construction. If using a PC board, it is best to solder the ICs and sockets in before other parts. Heat and solder both sides of the PCB if available since some of the interconnects are made through the legs of the IC or IC sockets. Before using the PCB make a couple of photocopies. Put a bottom and top together and staple all four corners. Hold it up to the light to ensure alignment is present. As each socket or IC is inserted and soldered, check continuity from point-to-point. When confirmed, use a yellow marker to mark the schematic traces as they are tested. This is the best way to

Parts List — part 2

Qty.	ID	Description	P/N	Vendor
1	CN	SIP40 interconnect header	160881	1
2	RN1, RN2	10k x 9-resistor net (SIP10) (cut off pin 10)	24643	1
1	CB	10 ft. RG-174/U mini-coax cable	60-238	5
1	C1	1000 µF 10 V elect cap radial	647-UVR1A102MPA	2
22	C2–C23	0.1 µF 20% 50 V mono cap radial	21RZ310	2
2	C24, C27	220 pF 10% 50 V NPO mono cap radial	21RD622	2
1	C25	10 pF 10% 50 V NPO mono cap radial	21RD710	2
1	C26	0.001 µF 10% 50 V X7R mono cap radial	21RX510	2
4	C28–31	0.01 µF 10% 50 V X7R mono cap radial	21RX410	2
1	C32	4.7 µF 10 V tant cap radial	80-T350A475K010	2
2	C33, C34	47 µF 10 V elect cap radial	140-MLRL10V47	2
4	R1,R4,R7,R20	10k 5% CF 1/4 W resistor	29911	1
1	R2	15 meg 20% CF 1/4 W resistor	291-15M	2
1	R3	22k 5% CF 1/4 W resistor	30453	1
2	R5, R14	1 meg 5% CF 1/4 W resistor	29698	1
1	R6	220k 5% CF 1/4 W resistor	-----	1
2	R8, R9	330 5% CF 1/4 W resistor	30867	1
2	R10, R16	4700 5% CF 1/4 W resistor	31026	1
1	R11	120 5% CF 1/4 W resistor	30082	1
2	R12, R15	220 5% CF 1/4 W resistor	30470	1
1	R13	1k 5% CF 1/4 W resistor	29663	1
1	R17	680 5% CF 1/4 W resistor	31499	1
1	R18	470 5% CF 1/4 W resistor	31165	1
1	R19	15k 5% CF 1/4 W resistor	30146	1
Optional				
1	L1	Dual 8.2 mH common mode choke	18-129	5
1	Z1	8 VDC MOV	96891	1
Wire-Wrap Items				
1	Wire-wrap/unwrap stripper tool		276-1570A	7
1	AWG 30 Kynar wire-wrap wire (many colors)		22605	1
Parts Vendor Key				
1	Jameco Electronics, 1355 Shoreway Rd., Belmont CA 94002; 800-831-4242			
2	Mouser Electronics, 958 N. Main St., Mansfield TX 76063-4827; 800-346-4242			
3	Ten-Tec, Sevierville TN 37862			
4	Digi-Key Corp., 701 Brooks Ave. S., Thief River Falls MN 56701; 800-344-4539			
5	Hosfelt Electronics, 2700 Sunset Blvd., Steubenville OH 43952; 800-524-6464			
6	Far Circuits, 18N 640 Field Ct., Dundee IL 60118			
7	Radio Shack (local stores)			
8	Your choice			

CORRECTION: In Fig. 5 on page 13 of our May issue, pins 16 of U15–18 should go to +6V, not ground. Also, please note that PCBs may not be available for this project.

ensure a trouble-free end result. A scratch through one of the traces can give you pure hell. The PCBs are supplied with solder over tin plate.

When sockets or ICs are in place, check the voltage to each IC or socket. Next, insert resistor networks, DIP switches, discrete resistors, capacitors, and crystal. If the enclosure is prepared, insert the wall transformer wire through a grommet and attach to the PCB by soldering. Warning: Observe polarity. Mount the front panel switches and LEDs.

Display assembly

Absolutely, use machine pin IC sockets with these expensive displays. When the wraps have been verified with sockets mounted, attach the 40-pin SIP interconnect. Insert the LSD digit ONLY! Power up and see if anything is working. You should get a visual indication on the display if everything is OK. Upon verification, remove the power and insert the other eight displays. Power up again to ensure that all nine digits look good.

Attach the RG-174/U coax input (50 MHz) to pin 4 of U-1 (CD-4536) and observe about 32768 on the displays. Almost always there is a number a little higher than 32768 Hz. This can be trimmed using the digital switches. Remember their weighted values when setting. There is approximately a 500:1 ratio between the PLL osc and the XTL frequencies. Adjust for 32768, which will ball park you to the correct settings.

Next, use the WWV 10 MHz to reference. A dummy load and transceiver with a digital readout as an RF signal source will get you very close. Usually the first bank of switches will tweak in the 10 MHz reference signal. Flick on the prescale (500 MHz) to test the 4-second time base and you should get the same reading as the direct shot. Direct is good to about 50 MHz (1 sec time base) and prescale is good to over 500 MHz (4 sec time base) (74LS00 = 35 MHz, 74ALS00 = 50 MHz).

As an optional item, and I think a very good investment, you can add a common mode line filter. The filter is designed so as to allow a low pass from

Header #1		Header #4	
R1	10k	Q1	MPF102
R2	15M	Q2	PN2369A
R3	22k	C21	0.1 µF
R8	330	R17	680
C9	Jumper wire	R18	470
C5	220 pF NPO	R19	15k
C6	10 pF NPO	R15	220
X1	32768 Hz xtl	Plug (DIP16) ST Socket	
Header #2		C28	0.01 µF
C13	Jumper wire	D5	1N4148
C10	0.001 µF	D6	1N4148
C11	0.1 µF	C29	0.01 µF
R6	330k	AWG-22	Stranded black wire (interconnect) to Counter bd. [Note: Interconnect Counter bd. to Display bd. via SIP40]
R7	10k	WW Socket U-12	
R5	1M	Q3	PN5771
R20	10k	U12	CA-3199-E
R9	330	C27	220 pF NPO
		C19	0.01 µF
		C34	47 µF
Header #3			
U5	NEC PS2501-1	D1	1N4148
C33	0.01 µF	D2	1N4148
C32	4.7 µF tant	R14	1M
R13	1k	R16	4700

Notes: IC pins 9 & 10 have 0.1 µF cap between pin 8 & 18. IC pins 8 & 9 have 0.1 µF cap beween pins 7 & 14. Use 18-pin DIP sockets for DIP16 ICs. Use 16-pin DIP sockets for DIP14 ICs. ICs U1 through U18 have 0.1 µF caps Vdd to Vss. If sockets such as Hosfelt #21-338 are used, then C2–C23 can be eliminated, since the 0.1 µF is manufactured integral to the socket.

***Table 2.** Header component locations.*

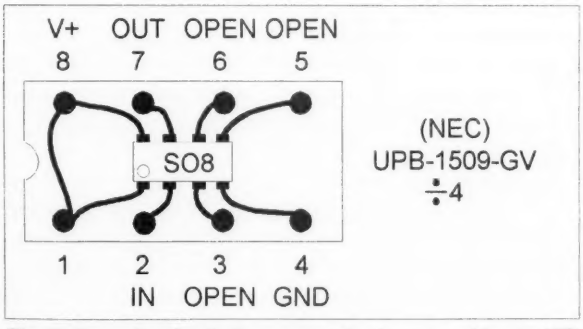

***Fig. 7.** Prescaler detail. I recommend using a machine in (ST) socket (DIP-8) as a carrier for SO-8 device. (1) Connect (solder) wire-wrap wire to each pin on the SO-8 device. (2) Glue SO-8 to socket. (3) Solder each wire to each pin on the (ST) socket. Note: As an alternative to the CA-3199-E (DIP-8) IC, use a machine pin DIP-8 solder tail IC socket for a header for the UPB-1509-GV IC. Glue a surface mount SO-8 to socket. Use wire-wrap and solder for connections.*

400 kHz down to 1 Hz. This is a 35-cent device which blocks most of the digital noise from running through the wall converter on to the power lines. This filter is mounted to the enclosure cover using clear 100% silicone caulk. Wires are twisted and returned to the PCB for connection. Leave the lengths long enough to

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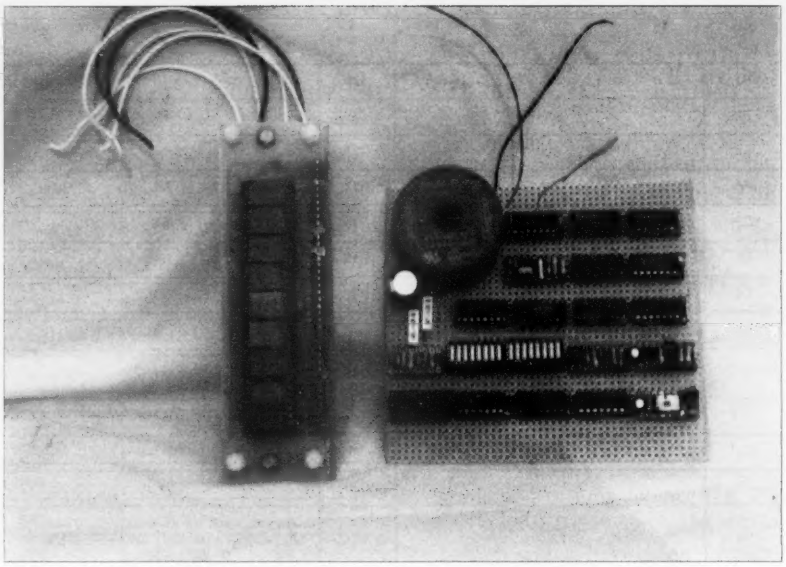

Photo C. *Wire-wrapped main board.*

remove the enclosure cover. This filter keeps AC line noises from getting into the counter circuits also! The device is a dual 8.2 MH 5 amp 0.2 ohm AC filter choke made by Pulse Engineering as part number PE-96180, which is sold at 35 cents each from Hosfelt (part number 18-129).

The time base stability is maintained because of the chronograph watch crystal being used which exhibits about ±25ppm over the specified temperature range. This crystal uses a tuning fork to achieve the subharmonic frequency of 32768 Hz. This frequency is then divided binarily by powers of two to get a one second (0.5 Hz) gate window. In watches the pulse is used to make a stepper motor move mechanical gearing. In our application the window opening is what we are interested in. The digital divide by N and DIP switches select the PLL multiplier frequency plus 512 and divides it for trimming the window. The $2^{16} + 2^{9}$ equal a 2^{25} overall ratio, which provides a pretty exact count period or gate.

The window opens for a 4 second period 2^{18} 0.125 Hz/50% duty cycle, which gives a 131,072:1 ratio between the crystal oscillator pulses and the divided 4 second pulse. The use of U-3 and U-4 provides a 512:1 multiplier function. That is, a 2^{9}addition to the 2^{16} thus giving us a 2^{25} resolution. This results in approximately a 13,107,200:1 overall resolution. This is at least a ±1 Hz resolution of the frequency being measured. That is really something at 150 MHz!

The effect of temperature has literally no effect on the gate window since the corrective PLL circuit tracks the 32768 Hz crystal tuning for frequency. That is, they drift together! Equals divided by equals are still equal! Well, you get it! All the drifting, what little there would be over temperature, is nullified. The PLL VCO frequency runs at 16,777,216 MHz. My attempt to run it at 33 MHz resulted in PLL slew rate failures. That is, we reached the toggle limit of the PLL IC chip (74HC4046).

The use of standard multisourced 74HC devices was the best I could do. These devices are silicon gate CMOS logic devices which exhibit good noise immunity and low power, including a toggle speed of about 7 nS (40 MHz) and sometimes 60 MHz. The cellular telephone industry has provided us with some nice surface mount prescaler divide by N devices and at about $2 each. These MMIC 2 GHz 50 mV prescale divide by 2,4,8 devices at two bucks each are just unbelievable.

Well, folks, we need to look at the new items which can move our hobby ahead. The influx of Japanese transceivers, and the don't-have-to-know-anything licensing program deterioration of our hobby, has not done a lot for us. So, let's get at it and update the technical end of the hobby so that these political misfortunes will not degrade our hobby any further. I plan on developing several lab-quality instruments so I can move on to some new areas of the hobby without having to spend a lifetime and a small fortune on instrumentation. 73

Carl G. Herbert AA2JZ
43 South Plank Rd.
Newburgh NY 12550

Temp-Controlled Solder Station

Here's a simple project to improve your bench.

Don't I just "hate" that! You know, you're soldering (or desoldering parts), having the time of your life, and there's no place to put the hot pencil down. That little tin "thing" included with the pencil survived about one day, when it either collapsed from fear or ran away, never to return.

I, for one, can't blame it much. I wouldn't want all that heat on my frail frame either! Now, I like using my RS "bulb squeezer desolderer," but I would like it better if it were a little more sophisticated.

"There has to be a better way," I mused. Chiding myself gently, I sighed and thought, "Well, ham, how are you going to solve this problem?"

Just a resting place for the hot pencil would suffice, but while you're building, why not make something just a little better? How about a holder, with a control device to regulate the heat and an indicator to tell me that I've left the iron on, and something that would look respectable besides.

Part	Part No.	Source
Metal cabinet	270-253	Radio Shack
Fan speed control	Home improvement center, $8.00	
1/4" x 3' eye bolts	Home improvement center, $1.80	
Neon indicator	272-710	Radio Shack
Power switch	275-1565	Radio Shack
AC outlet	161-0709	Mouser
Miscellaneous: AC cord with strain relief, nuts, screws, washers, paint, letttering — all as required.		

Table 1. *Parts list.*

"Whew, you don't want much," I mumbled to myself.

Scrounging around in the junk box, I came across the first thing to appear: the remains of the power supply from an old computer. A "snap-in" AC receptacle, a power cord (three-wire), a power switch, and one used chassis with cover (a hamfest "find" of last summer) also made their debut.

Now, I realize that my "junk box" is much deeper than most, and I suppose you'll have to go and buy some of the parts. I've included a shopping list to help you along (see **Table 1**).

A short trip to the home improvement store produced a ceiling fan controller and a package containing two 5/16" by 6" "eye bolts" with machine threads. The ceiling fan controller is nothing more than a variable resistor to dissipate power, thereby causing the fan motor to rotate slower. It also has an on/off switch built into it. We can use this to "cut back" on the amount of power supplied to the pencil, causing it to operate at a lower temperature.

The "eye bolts" required minor surgery to "fit" on my cabinet: I removed all but 1/2" of the threaded portion. The weight of the pencil is negligible, and the "eye bolts" will be used for a

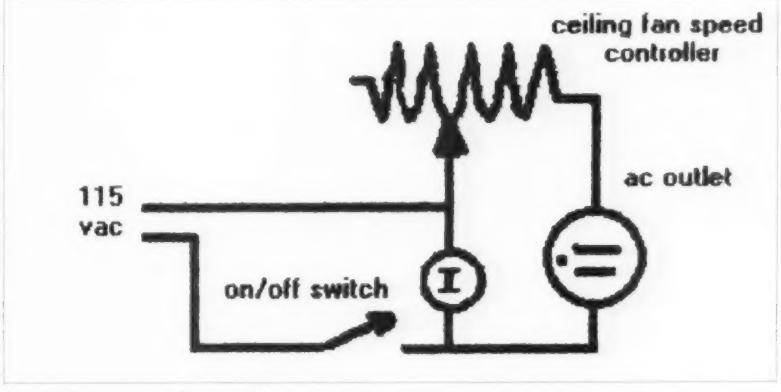

Fig. 1. *Heat controller circuit.*

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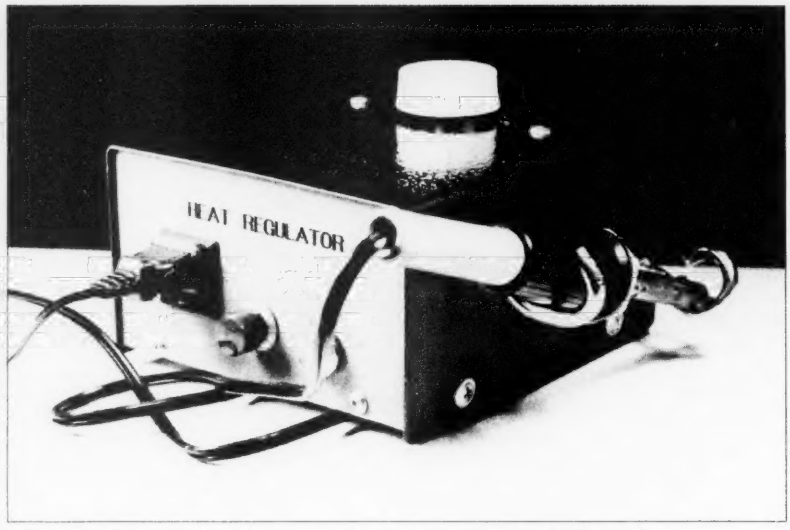

***Photo A.** This attractive unit will control the heat to your soldering tool.*

resting place for the heated pencil. Nuts and washers hold the "eye bolts" on the side of the cover. The "eye" portion of one bolt must be opened to form a cradle to hold the pencil handle. The other may have to be adjusted, depending upon your device to be stored. The "eye" was formed by a pressing device at the factory, so you'll probably experience some difficulty beginning to open the "eye." Once started, however, it gives up and submits to your desires. Be patient, be careful, and try not to damage either the threads or the finish on the "eye."

Wiring the device is as easy as it gets. (See **Fig. 1**.) The controller is basically a variable resistor placed in-line with the heating element of the tool to control "how much" power is allowed to reach the tool. The indicator, while not totally necessary, stops me from leaving the unit on when it is no longer being used.

I placed my controller on the top cover by cutting an oversized hole to accommodate the securing nut on the shaft. The entire assembly is attached to the cover with nuts, bolts, and washers. The square hole for the AC receptacle was cut to size, and a hole for the power indicator drilled alongside. While doing the metal work, the hole for the on/off switch was drilled to size. The controller switch could have been used. Using an additional switch allows me to leave the controller "set" and not require readjustment each time the unit is turned on (see **Photo A**).

The completed project meets all the requirements. It's functional, inexpensive, and easy to build. Finishing paint and labeling is your choice. I used "adhesive-backed shelf paper" to cover the front panel and paint on the cover. It matches the other devices I've built, but the choice of finish is entirely yours. This project will live on your bench and become an integral part of your building adventures. Devices such as this are some of the basic "needs" of the home builder. 73

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Hugh Wells W6WTU
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Restoring an HQ-140-X — Part II

This Hammarlund rig has always been a favorite.

Part I of this series focused on the condition, both electrical as well as physical, of my Hammarlund HQ-140-X receiver. Once it was determined that the receiver had no major electronic faults, power was left on and a series of diagnostic tests were performed to ascertain the health of the receiver. Since my HQ-140-X appeared to be functional per the original design intent, a clean-up and restoration process was then laid out.

All my HQ-140-X really needed was a very good "bath" and mechanical parts lubrication. Of course, it isn't a good idea to immerse a receiver in a tub of water, though my receiver certainly deserved it because of the dirt and filth that it exhibited (see "before" photos **A** and **B**).

The filth on the panel appeared to be the color of nicotine-stained dirt enhanced with perspiration, all caked on during many years of use. The filth was really very difficult to remove, but patience paid off as the brush and detergent worked through the grime to remove it without marring the painted surface. To accomplish the cleaning, I used a toothbrush, dish detergent, and water to scrub the panel and knobs. Here is the procedure that I used, with cautions noted:

- DO NOT press against the meter glass.
- DO NOT use a solvent as a cleaner, as it could soften, bleach, or stain the painted surface.
- Clean using only a mixture of dish detergent and water.
- Using the mixture, scrub with a toothbrush.
- Wipe with a paper towel before the mixture dries.
- Repeat the above cleaning steps until satisfied that all of the dirt is removed.
- Be patient.
- Apply Johnson's Pledge to the panel. Polish with a soft cloth.

After getting all of the dirt removed, the panel was waxed. Waxing of the painted panel was accomplished by spraying it with Johnson's Pledge, and

Photo A. *The receiver as it was removed from storage. Note the dirt on the cover and the dark stains around the knobs.*

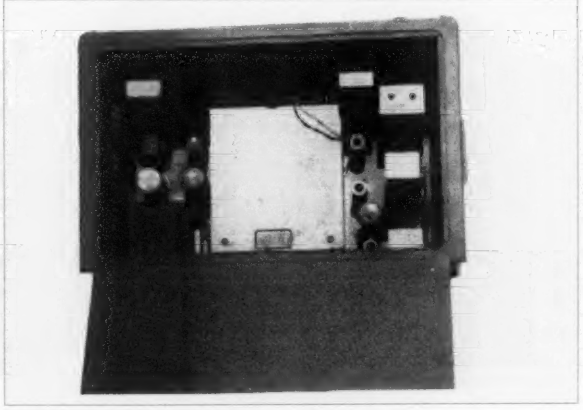


Photo B. *This view shows the dirty interior of the receiver after removal from storage.*

Photo C. *The front panel after it was cleaned and waxed.*

then wiping it down with a soft cloth until it "glowed."

Cleaning of the cabinet was much easier than the panel because it did not contain any electronics. The cabinet of my HQ-140-X has a gray hammertone finish, not a black wrinkle as was used on some receiver cabinets. Although my cabinet finish shows some minor scratches, it is otherwise in pretty good shape. Here is the procedure for cleaning the painted cabinet:

- Use a stiff-bristle fiber or paint brush.
- Use a mixture of dish detergent and water.
- Apply the mixture to all surfaces of the cabinet.
- Scrub the dirt inside and out of the cabinet.
- DO NOT allow the detergent to dry on the paint.
- Wash/rinse with large amounts of water while scrubbing with a brush.
- Dry the cabinet with towels to remove all excess water.
- Dry the cabinet in the sunlight to remove trapped water.
- Inspect the cabinet for any remaining dirt; repeat the cleaning process as necessary.
- Use automobile finish wax or Johnson's Pledge on the painted surfaces.
- Polish the surface with a soft cloth.

Note: If using automobile wax, a white residue will build up in scratches and crevices. Remove the residue by wiping with a dry toothbrush.

I soaped up the entire cabinet, inside and out, to loosen and remove as much dirt and grime as possible. A garden hose was used to flush away the soap and debris. The cabinet was then dried with a towel and placed in the warm sun to evaporate any trapped water.

After the cabinet was dried, a small amount of automobile car polish was used to lightly clean up the finish because some stains appeared on the surface that were not removable with soap and water. Hammertone paint can show up attempts to clean with an abrasive polish, including automobile polish, so care must be taken to use the cleaner only to remove the majority of caked-on dirt, oxides and stains, but not to remove the surface of the paint. Once the cabinet finish is clean, it can be waxed using either an automotive finish wax, or Johnson's Pledge.

The "after" photos, **C** and **D**, show the appearance of my receiver after the process was completed. The front panel view of my HQ-140-X looks like a "new" receiver, just in case the photos fail to show it that way. Unfortunately, a few scratches on the cabinet top cover and the chassis give away the secret.

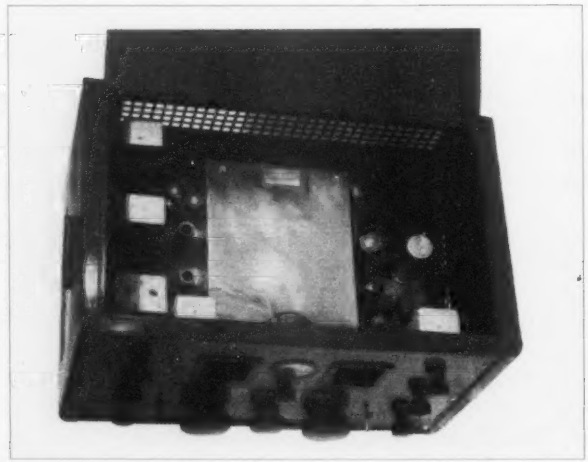


Photo D. *This is how the internal chassis looked after it was scrubbed clean with a stiff-bristled fiber brush.*

Internal cleaning

Up until this point only the exterior surfaces have been discussed. **Photos E, F,** and **G** show the internal condition with **Photo E** showing the greatest amount of dirt buildup. Fortunately, the underside of the chassis was protected by the cabinet, so that dirt and debris was not evident.

Cleaning of the chassis was more difficult than the panel or cabinet because it was desired to not get the cad-plated chassis wet, which might allow it to corrode or rust in the future. After deliberation, I elected to use a stiff-bristled fiber brush to mechanically remove the bulk of the dirt. Continued brushing, with a lot of patience, removed the majority of the dirt accumulation improving the appearance of the chassis. Brushing of the painted on tube nomenclature was avoided, as it would have removed the marking.

One of the advantages of using the fiber bristle is that it does not leave scratches in the cad plating of the chassis. Marking or scratching of the chassis could reduce the potential market or museum value, and that was to be avoided even though I intend to retain the receiver.

Removing dirt and grime improves the appearance of the receiver, but does little regarding its performance. During the initial evaluation, it was noted that noisy pots, the ganged tuning capacitor, and switches required attention to clean them up.

Two steps were taken to improve their operation. (Note: A TV tuner cleaner was selected for use because it DOES NOT CONTAIN an oil or solvent that could permanently damage the pots or switch wafers. Also, it does not contain a conductive material that would change the conductivity of the switch wafers.)

(1) The aerosol TV tuner cleaner was used by spraying it into the pot

openings with the objective of cleaning the resistor card within. The pot shafts were rotated as the cleaner was injected. The cleaner was also injected into the shaft/bushing to loosen up the mechanical operation.

Cleaning of the bandswitch followed a similar procedure where the contacts were sprayed judiciously with the cleaner. An excessive amount of cleaner would have overly wet the switch wafers, requiring a lengthy period of time for them to dry.

(2) Lubrication of the tuning capacitor shaft was required to eliminate the "drag" that appeared due to a lack of lubrication during the many years of use. Oil was also applied to the antibacklash gears to free them from friction.

A small amount of light motor oil was carried with a thin shaft screwdriver to each of the shaft bearings. At most, only a drop of oil was required, and any excess was removed with a paper tissue. The capacitor shaft was rotated as the oil was being applied with the objective of working the oil onto the bearing surface. Also, the detent ball bearings in the band switch assembly were lubed using drops of motor oil applied with the thin screwdriver shaft.

Operation

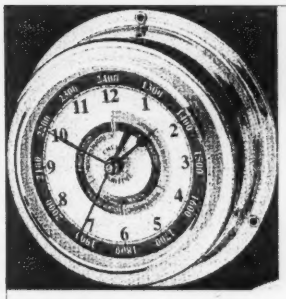
Because most of the present low band operation is with single sideband, and with the HQ-140-X having only an AM detector, an operating technique was needed to demodulate SSB signals. After playing with the receiver's controls, the following technique was found to make it perform in a manner as if the receiver had a product detector.

- Set the AUDIO GAIN control to max.
- Reduce the SENSITIVITY control slightly.
- BFO selected.
- Set the CW TONE control to "–2".

Dial in an SSB station and adjust the fine tuning for best clarity of the signal. Adjust the SENSITIVITY control for the desired volume. With the sensitivity setting at MAXIMUM, the signal WILL NOT demodulate correctly, but the signal clarity will improve as the control setting is reduced.

With a station tuned in, the CW Tone control may be used as a signal clarifier by rocking it back and forth slightly — or the fine-tuning control may be adjusted. Regardless of whether listening to LSB or USB, leaving the BFO at "–2" seems to work well.

Continued on page 30



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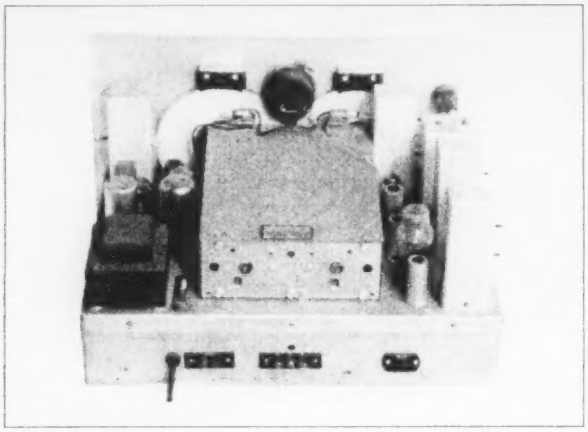


Photo E. *This photo shows the chassis outside of the cabinet before it was cleaned.*

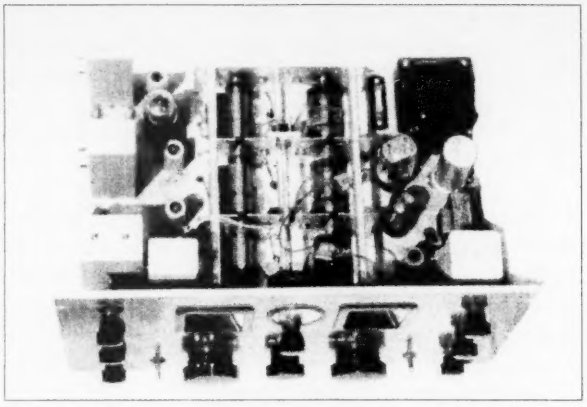


Photo F. *The tuning capacitor cover was removed prior to cleaning the chassis. After cleaning, the capacitor shaft bearings were lubricated before the cover was replaced.*

Restoring an HQ-140-X — Part II

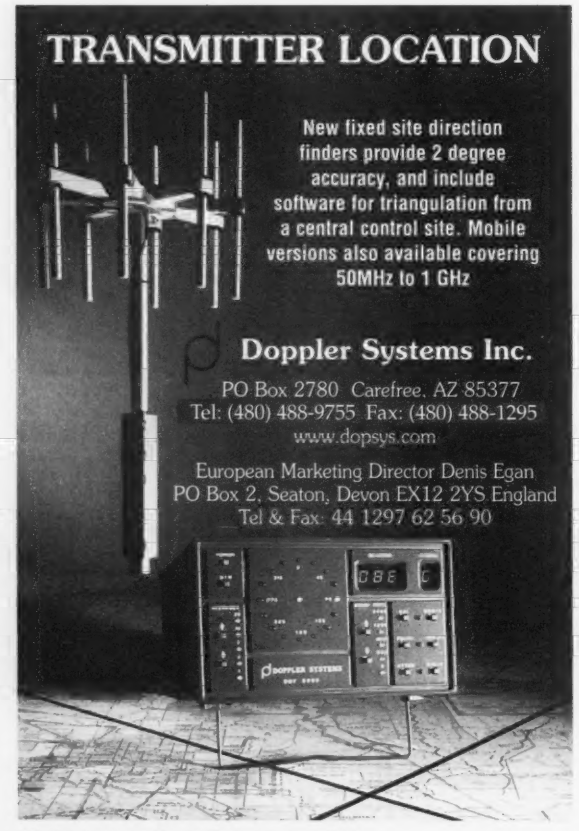
continued from page 29

Another observation that I made was with the use of the crystal filter. There wasn't any significant QRM during my test period, should it be a factor, but I did select and adjust the crystal filter to see how effective that it might be. In the narrowest setting, "5", the bandwidth appeared to be less than 2 kHz and wasn't really suitable for phone reception, but appeared to be excellent for CW. Crystal switch settings at positions "1" and "2" appeared to be adequate for SSB operation where an estimated bandwidth of 4–6 kHz was achieved. An adjustment of the CRYSTAL PHASING control provided an excellent means for separating adjacent stations.

Conclusions

Before wrapping up the receiver project, I tried it on several antennas to see how it might compare relative to the antenna type and to a solid-state radio that resides on my bench. The measure that I used for this test was to see if the receiver would hear the same DX stations as the solid-state radio. Was I surprised when one of the first stations that I heard on the HQ-140-X was an 0Z9 (Denmark) station swinging the meter to an S9 (BFO off). Upon tuning around

Continued on page 56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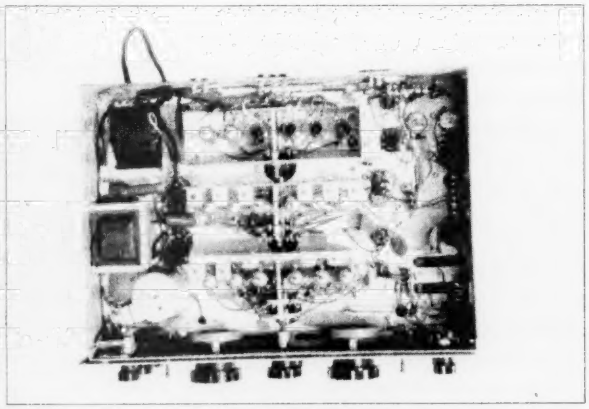

Photo G. *This is a view of the underside of the chassis. Being enclosed within the cabinet, no dirt was detected. Cleaning of switch contacts and oiling of the switch bearings was performed prior to installing the chassis back into the cabinet.*

Henryk Kotowski SMØJHF
Sibeliusgången 28 XI
SE-164 77 Kista
Sweden

Travels with Henryk — Part 5

The niceties of Norway.

During the past twenty years, the number of amateur radio operators in Norway has greatly increased since the country struck it rich with offshore oil. Thankfully, though, people have not become spoiled by this upswing in the economy, and they are still friendly and hard working. They do seem a little bit shy and withdrawn, which is something I noticed while traveling through this long and narrow country of Scandinavia.

Photo A. *Visitor/operator LA2CKA enjoys using special station LG5LG in Morokulien, Norway.*

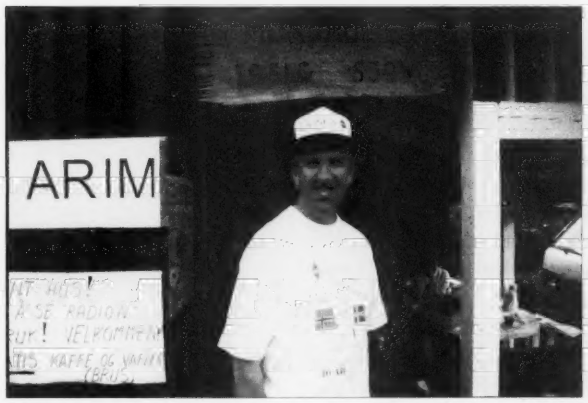

Photo B. *Svein Arne LA3SEA, a volunteer working for ARIM, enjoys operating this club station in Morokulien.*

The most spectacular entry point from Sweden is the border crossing in Morokulien. This place was created to support peace efforts by Swedes and Norwegians.

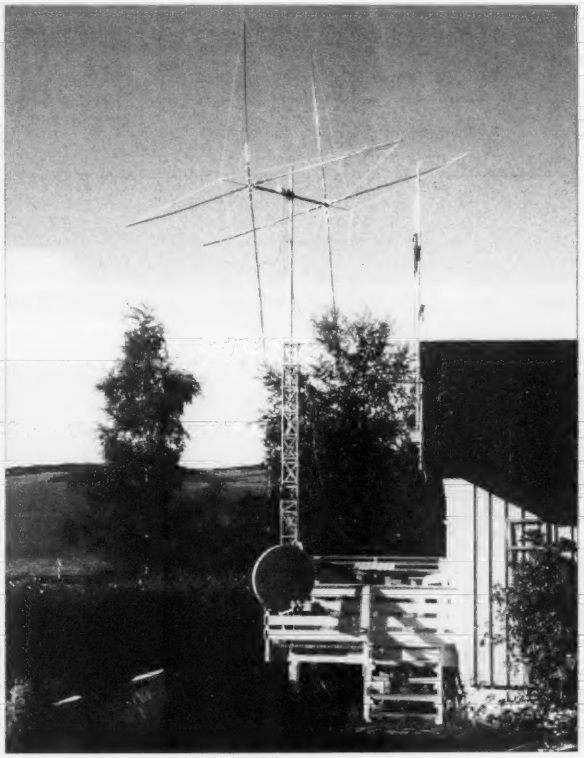

Photo C. *Eat your heart out! This ham shack near a lake in Skogn has its antennas on an attached deck.*

Photo D. *This VHF/UHF antenna belongs to the LA1K ARC in Trondheim.*

One of its highlights is an amateur radio club station shared by hams of the two countries. There is a spacious radio shack (**Photo A**) and regular living quarters — all is for rent — and hundreds of visitors from all over the world have been here and operated radio using one of the two callsigns: LG5LG and SJ9WL. This club station is supervised by a joint-group called ARIM. One of the volunteers working for it is Svein Arne LA3SEA (**Photo B**). The cottage is actually on the Norwegian side of the border, but the 75m dipole hangs in Sweden, they say.

I drove farther north. Using 2m FM radio I was trying to get in touch with local hams, but very seldom would anyone respond to my calls.

In the small village of Skogn I spotted a nice cubical quad antenna (**Photo C**) and a few other HF and VHF antennas. But nobody was at home, so I still don't know to whom they belonged.

Photo E. *Martin LA3JJA operates at the LA1K ARC club station.*

Photo F. *Espen LA6MGA remained a member of the LA1K ARC even after graduating from the technical school.*

In Trondheim, a significant and ancient city, I saw some amateur radio antennas from the main road (**Photo D**). This turned out to be the local technical college campus, and the antennas were part of the versatile amateur radio club LA1K. Martin LA3JJA (**Photo E**) happened to be near and helped me to see the club from inside and meet a few other members. This is one of the oldest and most prolific clubs in Norway, but on the other hand, they have a steady stream of students who join them and really get engaged in club activities. Some remain members of the club even after finishing their studies, like Espen LA6MGA (**Photo F**). There are a few operating positions for HF and VHF, well-equipped shop and test lab, a library and a bar.

Continued on page 56

Photo G. *Esgil LA9MB erected this HF array in Trondheim.*

Photo H. *The local amateur radio club (LA1N) in Narvik operates from this attractive location.*

Carl Markle K8IHQ
11570 Taylor Wells Rd.
Clairdon OH 44024-8910

Glow, Little Glo-Bar

We bet THIS gets you thinking.

This is a quick weekend project — a remotely located high-power RF dummy load. It can handle a 1 kW CW carrier for about 30 seconds at a time. It is designed for the terminating end of a coax run and can be used as a dummy load or a dummy antenna.

How many times have you wondered what amount of RF was getting to the antenna system? Well, if a dummy load were at the end of that coax line, you could see how the SWR was, which would give you a good idea of how much is getting to your antenna system. When the dummy load is switch-selected, or manually connected to the end of the coax line, the power output or SWR will give you a good comparison reference. It is also a good test for the condition of the coax and connectors.

The inexpensive remote dummy load shown here can do the job quite nicely and at a cost of under ten dollars. The home-brew of such items is still possible without needing a bank loan to pay for them! I have noted in the last twenty years an increase of about 500% in the cost of a commercial type of load, which is due largely to governmental regulations and the cost of doing business.

So, we take a trip to a couple of the summertime hamfests and browse a bit to locate what are called a noninductive "Glass" Glo-Bar (Sprague Electric Co.) power resistor. Usually these are in the 75-ohm area, but sometimes there are 40- and 50-ohm types available. The Sprague Company rated these bar resistors at 600 watts DC power in the old days. Do not be confused with the wire dual-winding types that some of the companies call "noninductive." Those are not noninductive types!

Noninductive resistors are milk white in color and have large, silver-plated end caps on them. See **Photo A** to get an idea of what one of these guys looks like. These resistors usually sell for from fifty cents to a dollar each at the flea market.

Now that you own one, let us see how to construct a high-power HF RF dummy load. These loads can take 1 kW CW for about 30 seconds at a-couple-minute intervals with no problem. Getting wire connections to these end caps is the next trick. If you are lucky, your find might just have the original snap-on clamps that have lug screws to make things easy for you. In most cases, they do not come with those convenient attachments. So, we now procure a couple of stainless steel automotive hose clamps to do the job of making a tight wire-to-end-cap connection. I do not recommend trying to solder to the end caps, since the resistor element inside the glass enclosure may disconnect.

Now that you have a couple of AWG-12 wires connected using hose clamps, you are ready to do the physical mounting of the resistor inside of the two-inch PVC pipe. This may try your patience a bit! I used a couple of stainless steel screws, nuts, and lock washers to do the mounting. Just drill holes in the pipe and mount them. The PVC pipe is a good insulator and

Photo A. *Dummy load component parts.*

Qty.	Item	Cost
12 in.	3 in. gray PVC pipe	$ .30
1	2 in. PVC cap	$1.00
1	2 in. PVC coupling	$ .30
1	2 in. x 1.5 in. PVC reducer	$ .60
1	1.5 in. test plug	$ .10
1	SO-239 coax receptacle	$1.00
4	SS #6-32 screws, nuts, washers	$1.00
2 ft.	Stranded AWG-12 (14 OK) wire	$ .20
4	SS #4 sheet metal screws	$ .20
2	SS 1 in. automotive hose clamps	$1.00
2	SS #10-1 screws, nuts, washers	$1.00
1	75 ohm (50 ohm) Glo-Bar glass resistor	$1.00
Note: NIBCO brand DWV PVC fittings are recommended.		

Table 1. *List of materials.*

works just fine. Now feed the two wires to one end of the pipe so they can be attached to the SO-239 coax connector.

The SO-239 is mounted to the two-inch test plug using stainless steel screws, nuts, and washers. It is placed in the 2" x 1.5" PVC reducer fitting using a little clear 100% silicone caulk. Allow the caulk to dry overnight to be sure there will be no leaks. It is not necessary, but I mixed up a little automotive epoxy made by Permatex Corporation that is used in automotive body repair. It is a clear material and pours into the cavity to make sure there is a waterproofed connector. I also drill a few holes around the rim of the PVC reducer so the epoxy has a good grip on things. Make sure you put the two-inch PVC coupling over the wires before attaching to the SO-239 assembly.

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Now comes the sealing part of the assembly. Make sure you have a couple of stainless steel bolts, 0.25" x 2", attached to the pipe so that attachment to a tower leg is possible. I use the common NEC-approved ground clamp to attach the assembly to my tower leg. When you slip-fit all of this PVC stuff together and it fits OK, the next move is to either glue or screw the parts together. I use #4 x 0.5" stainless steel sheet metal screws to complete my permanent attachment.

If I ever want to go back into the assembly, it is not a problem. If you use glue to do this — you have a problem! I use a one-sixteenth drill bit to make a vent hole on the top cap and several along the side of the pipe to provide a breathing system for the resistor. Any condensation from heat expansion can ventilate out of these holes. Do not make them bigger or you will provide a nice home for some of those bad insects!

Remember, those screws holding the resistor are RF hot and should not come in contact with anything! I usually put a dab of clear 100% silicone caulk over them just to make sure.

Now comes your test. Put the dummy load at the end of your coax feedline and fire up the rig to see what kind of SWR you come up with. Start with 10 watts output. Move up to 100 watts when you feel comfortable, and if the SWR is less than 2:1. You should be able to tune out the reactance with your tuner without any problem. Use 80 meters to make things easy on yourself! If you are using a 75-ohm resistor and 75-ohm coax as I do, then a 1:1 SWR should be present and your whole 100 watts will go out to the dummy load. If you are using 50-ohm coax and a 75-ohm resistor, then a 1.5:1 SWR would be present. No big problem figuring this out, you say. Yes, you are right, so do not pass up a chance to purchase a 75-ohm resistor just because you are using 50-ohm coax. You are smart enough to figure the mismatch between the two impedances, so 1.5:1 is really a 1:1 SWR with good coax and connectors.

Now, just a couple of words to those hams who are biting at the bit because I did not include the 145 and 440 MHz gang. You are usually operating under 100 watts in the range. Mouser Electronics and Digi-Key Electronics both sell what we call MOF resistors. These are metal oxide film types, i.e., really noninductive types. If several of these are connected together in parallel, a 100-watt dummy load can be made for VHF/UHF use. They are in 5-watt sizes in the less than fifty cents price range. Capacitive and inductive reactances are really present in these frequency ranges, so you will have to carefully consider this when designing. Nothing to be afraid of — just be aware. About ten of these 5-watt resistors should do the job for you. A 30-second 100-watt rating is probably OK. You can stick the assembly into a glass jar full of mineral oil and take the power on up if you like. Just be a little creative!

As I have always mentioned, the best SWR match is when using an odd multiple of electrical one-half wavelengths of coax cable. You must figure the velocity factor to get the electrical wavelength correct — just look it up in an ARRL handbook for the coax you are using. If the SWR is up because of some odd length of coax, then you will have heating and high voltage breakdown problems, not to mention possible TVI or RFI.

When matched properly, most of your RF will now get to your antenna system if the impedance of the driven element has a reactive resistance somewhere between 50 and 75 ohms. If it does not, then a balun, gamma match, T-section, or some other form of RF transformer must be used to get the antenna driven element to match the coax impedance. All matching devices have losses, so try to avoid them if possible!

A final note. You must ground your outer shield of the coax-to-earth ground at the base of the tower preferably, both to ensure safety and to keep RF from running up the outside of the coax — TVI, RFI, and a lot of bad things. It is the FCC's rule that *RF and DC electrical earth ground must be used.* It also makes the antenna system efficient, which gives you the performance you are looking for. Good shopping! 73, Carl Markle K8IHQ. 73

Ozzie Levin W5RK
780 W. Bay Area Blvd. Apt. 1335
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Icom Interface, Texas-Style

This mod for 706/706MKII owners has concepts everybody can use.

Since I have been operating the digital modes, it has been like a breath of fresh air. I say that because I have been a dedicated CW buff, and it has finally taken a toll on my operating. One of the reasons is that I finally sold my home and moved into a retirement condo. Needless to say, no outdoor antennas allowed.

With this being the final word, I picked my apartment on the 3rd floor, hoping I would have access to the attic. Yep, that's what happened. Had a nice spacious attic above my apartment. Since I am 82 years old, I didn't know if I could maneuver on the studs, so I decided to get my son-in-law to do it for me. On my instructions, he installed a 70 ft. horizontal loop fed with 450 ohm ladderline. With the aid of an outboard tuner, it worked exceedingly well on 20 through 10.

However, this is where the digital modes came in handy. This being an extremely large condominium, they have 271 apartments. Everybody has one or more TV sets, fax machines, DVD players, and the like — and a lot of the old folks had pacemakers, too. Also, the apartments had electronic emergency phones, fire alarm systems, and security devices. Running 100 watts would activate some of these. Now came the digital modes. By using PSK, I was able to run 10 watts and no more than 35 watts — I was able to enjoy ham radio once again. I made many contacts and worked quite a few countries. I also decided to explore some of the other digital modes, so I downloaded programs that would work with my soundcard: RTTY, MFSK, Hellschreiber, MT63, and SSTV. They are all excellent programs and perform well.

Continued on page 56

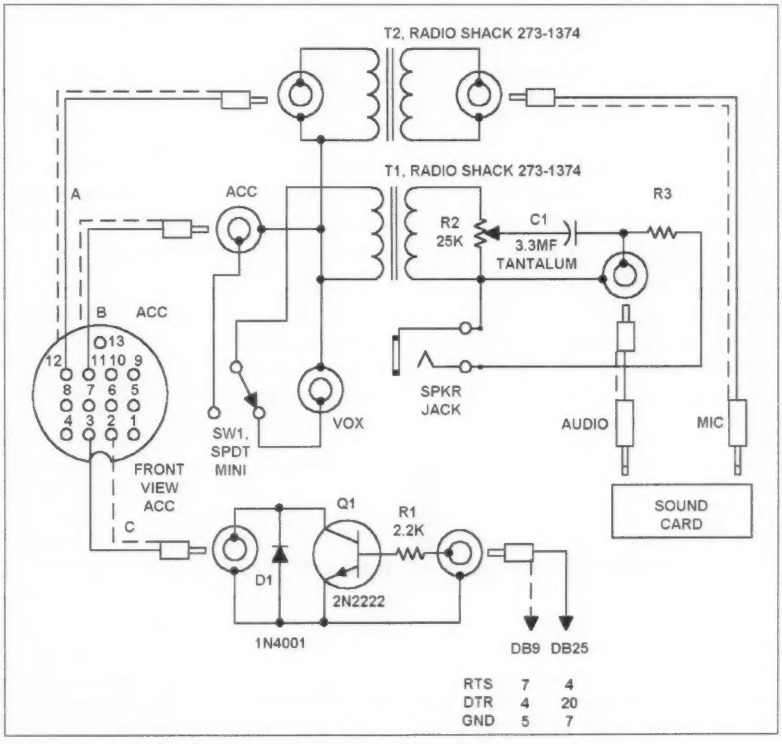

Fig. 1. *Icom 706/706MKII interface circuit. R3 is 5k.*

Frank Kelson HL1/N8HI
PSC 450, Box 0826
APO AP 96206-0826

Windowsill Mount for Verticals

For when you're not flying the flag.

Here is an idea for a windowsill mount for "Ye Olde Fishing Pole" antenna in the December 2001 issue. It should provide a reliable window mount for most antennas that would be used from an apartment where you have no other recourse in getting an antenna up for amateur radio applications.

I first used this type of windowsill mount when I moved to an apartment back in Brooklyn NY in the late 1950s. If constructed correctly, it should provide you with years of good service. In those days, I used a 16-foot-long tapered aluminum pole for 20 meters, and it withstood a multitude of abuse, including removing, replacing, and high winds.

You can use this type of mount for most any type of antenna that would be employed outside your window, and with a variety of tuning apparatuses that can be mounted on the inside of the mounting board.

For twenty meters I had a large inductor and variable capacitor mounted on the inside of the board. This inductor had a multitude of taps to employ, and was configured so that parallel and series tuning could be used by moving a variety of board-mounted clips.

I don't provide any specific measurements here as to screw, bolt, or angle bracket sizes — this will all depend on what you have in mind; the size and width of the particular windowsill that you will be using; and also what kind of pole that you may use for an antenna. You may have in mind many applications, depending on what available stock that you have on hand. My main intention is to provide you with an avenue in which to get an antenna outside. You even may elect to mount a small commercial antenna tuner on the apartment side of the board.

I would in most cases use for the board a phenolic material at least one inch in thickness. Wood could be employed, but I would recommend providing it with a good coat of varnish

Continued on page 57

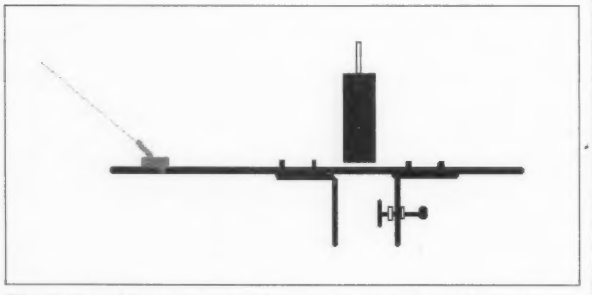

Fig. 1. *Board lies across inside and outside sills, underneath window itself. Author used a Walmart balcony flag mount with a clamp to hold the antenna.*

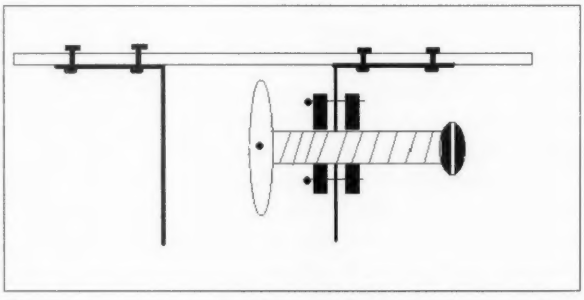

Fig. 2. *Screw-type tensioner has round pressure plate at end, under which a small piece of scrap plywood or similar material can be placed to protect surface of inner wall. Screw is turned through nuts fixed onto inner L-bracket, pushing pressure plate against inner wall and securing assembly by pulling outer L-bracket against outer wall.*

Calendar Events

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the September issue, we should receive it by June 30. Provide a clear, concise summary of the essential details about your Calendar Event.

JUNE 1

WASHINGTON TOWNSHIP, NJ The Bergen ARA will sponsor its Annual Spring Hamfest on Saturday, June 1st, at the Westwood Regional Jr./Sr. High School, 701 Ridgewood Rd., Washington Township NJ, approximately 15 minutes from the GW Bridge and 5 minutes from Paramus NJ. Vendors arrive at 6 a.m. General admission 8 a.m.–2 p.m. VE exams 8 a.m.–10 a.m. only. DXCC card checking. Rain or shine. Indoor and outdoor spaces. Lots of parking for tailgating. Admission is $5 donation (non-ham family members free), and vendors $10 per space. Rest room facilities and refreshments available. For more info check the BARA Web site at *[www.bara.org]* or contact *Jim Joyce K2ZO* at *[K2ZO@arrl.net]* or phone *201-664-6725*. Talk-in on 146.19/.79.

JUNE 9

WHEATON, IL The Six Meter Club of Chicago, Inc., will present their 45th annual ARRL sponsored ham radio and electronic flea market Hamfest at the DuPage County Fairgrounds, 2015 Manchester Rd. (North of Roosevelt Rd. (Rte. 38), east of County Farm Rd.). This is an all-weather hamfest with 3 buildings and a large outdoor flea market. Features include ARRL and dealer displays, food and refreshments, free parking — no extra charge for space in the outdoor flea market, limited overnight RV parking with electrical hookup, $15 each space — advance registration required. Advance tickets $5, $6 at the gate. Advance tickets available from *Six Meter Club of Chicago, 2335 South 2nd Ave., North Riverside IL 60546,* or from any club member. Payments for registrations must be received with an SASE no later than May 25th. Commercial 8-ft. tables with 110V in the air conditioned main building, $15 each. Indoor flea market tables. 8-ft. with no electric, $12 each. For info call the 24-hour InfoLine at *708-442-4961*. General parking is at the west gate. Sellers only at the east gate. For handicap parking use the east gate. Gates open at 7 a.m. Buildings open to the public at 8 a.m. Talk-in on K9ONA 146.52, K9ONA/R 146.37/.97 (107.2). VE exams 9 a.m.–11 a.m. Call the InfoLine to pre-register for exams. Please note: Absolutely no alcoholic beverages permitted. All sellers are responsible for cleanup of their spaces.

JUNE 15

DUNELLEN, NJ The Raritan Valley Radio Club's "Hamfest '99" will be held at Columbia Park, near the intersection of Routes 529 and 28. Sellers set up at 6 a.m. Buyers admitted 7 a.m.–2 p.m. Admission: Buyers $5, sellers $10 with $5 for each additional space. Talk-in on 146.625 R, 447.250 R tone 141.3, 146.520 simplex. Contact *Doug Benner W2NJH, 732-469-9009,* E-mail *[WB2NJH@AOL.COM];* or *Fred Werner KB2HZO, 732-968-7789* before 8 p.m.

JUNE 16

MONROE, MI The Monroe County Radio Communications Assn. will hold its annual "Monroe Hamfest" 7:30 a.m.–1 p.m., at the Monroe County Fairgrounds, 2 miles west of Monroe on M-50. Indoor tables $12 for each 8 ft. table. Trunk sales $6 per 8 ft. space. Overnight camping $15. Free parking, refreshments available. Talk-in on 146.72. Admission $6 in advance, includes two stubs for drawing; $6 at the door with one stub. Contact *Fred VanDaele KA8EBI, 4 Carl Dr., Monroe MI 48162.* Phone *734-242-9487* after 5 p.m., or E-mail at *[ka8ebi@arrl.net].* Reserve tables online at *[mcrca.org/hamfest.htm].*

JUNE 22

HASTINGS, MI Come to the Barry ARA Field Day Ham Radio and Computer Swap, June 22nd, 8 a.m. to Noon. The location is Charlton Park, 2545 S. Charlton Park Rd., Hastings MI. M79 east of Hastings, west of Nashville MI turn north on Charlton Park Rd. Admission Free. Trunk sales $5 per space and indoor vendor's tables $10 each, paid before June 1st. E-mail to *[K8YPW@ARRL.NET]* or write to *K8YPW, P.O. Box 370, Hastings MI 49058.* Talk-in on 146.46 FM. Setup at 7 a.m. VE exams 1 p.m. to 3 p.m. Advance reservations available until June 1st. Contact *N8ZSG* at *[peted @msgexp.net].* There will be family activities going on at the Historic Charlton Park Village. Free. Beach $5 per auto. Food vendors will be on the scene.

JUNE 23

EASTON, MD An Eastern Shore Hamfest sponsored by the Easton ARS will be presented Sunday, June 23rd, at the Talbot County Community Center at Mile Marker 61 on US Rt. 50, north of Easton. Field Day will be in progress. Those attending the hamfest are cordially invited to visit and participate in Field Day. General admission is $5 per person at the gate, no advance sale. This event will take place 8 a.m. to 4 p.m. Indoor exhibitor space includes chairs and electricity for $10 per 8 ft. table. Tailgating $5 per space plus admission. Free parking and lots of space. Setup will open at 6 a.m. Contact *Tinsley Meekins K3RUQ* at *410-770-3715,* or see the Club Web site at *[http://www.ajfox.com/ears/].* Talk-in on 147.0450(+) PL 156.7, WA3GVI 2-meter rptr.

JUNE 30

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Vendor setup at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. Food and refreshments. VE exams at 10 a.m. Admission by donation, buyers $5, Sellers $10 per space. Talk-in on 444.200 R, PL 136.5, and 146.52 simplex. Web site *[www.qsl.net/hosarc].* For further info, call at night only: *Stephen Greenbaum WB2KDG, 718-898-5599,* E-mail *[WB2KDG@Bigfoot.com].* For info about VE exams, contact *Lenny Menna W2LJM, 718-323-3464,* or E-mail to *[LMenna6568@aol.com].*

JULY 6

OAK CREEK, WI The South Milwaukee ARC Inc. will hold its 34th annual "Swapfest" on Saturday, July 6th, at the American Legion Post #434 grounds, 9327 S. Shepard Ave., Oak Creek WI, from 6:30 a.m. until at least 2 p.m. CDT. Free parking. A picnic area and limited free overnight camping are available. Admission $5 per person, includes "Happy Time" with free refreshments sometime during the day. For a free flyer with map, write to *The South Milwaukee Amateur Radio Club Inc., P.O. Box 102, South Milwaukee WI 53172-0102.* Talk-in on 146.52 simplex and on many of the local repeaters.

JULY 12, 13, 14

BRYCE, UT The 2002 Rocky Mountain Division ARRL Convention and 2002 Utah Hamfest will be held July 12th to the 14th at Ruby's Inn, Bryce UT, near Bryce Canyon

National Park. For more info please visit *[www.utahhamfest.org].*

JULY 14

PITTSBURGH, PA The North Hills ARC will hold its 17th annual Hamfest on July 14th, 8 a.m. to 3 p.m. at the Northland Public Library, 300 Cumberland Rd., Pittsburgh PA. The location is approx. 10 miles north of Pittsburgh on McKnight Rd., (Truck Route 19). At the 3rd traffic light after Northway Mall, turn left onto Cumberland Rd. Northland is on the left at the top of the second hill. From points north, take Route 19 south toward Pittsburgh. Follow the signs for McKnight Rd., and at the 4th traffic light turn right onto Cumberland Rd. If on Perry Highway, turn left onto Cumberland Rd. at the Sunoco. Talk-in and check-ins will be on 149.09 W3EXW, the North Hills ARC repeater. Free admission. Free parking. One free automobile-sized space per tailgater; each additional space $5. Handicap/wheelchair accessible. Refreshments will be available. For more info contact *Joe Springer, 2601 Clare St., Glenshaw PA 15116,* or phone *412-486-1681.* More info is also available on the Web site at *[www.nharc.pgh.pa.us].*

JULY 21

WASHINGTON, MO The 40th Annual Zero Beaters ARC Hamfest will be held July 21st, 6 a.m. to 2 p.m. at Bernie E. Hillerman Park. There will be a ham radio and computer flea market, technical sessions, ham radio demonstrations and more. Free parking. Free admission. Talk-in on 147.24(+) rptr. Watch for green on white hamfest signs. VE exams registration starts at 9 a.m. Walk-ins welcome (limit 60). Bring original license and a photocopy. For info SASE to *ZBARC VE Exam, P.O. Box 1305, Washington MO 63090.*

JULY 27

CINCINNATI, OH The OH-KY-IN ARS, Inc. will sponsor their 5th Annual Hamfest at Diamond Oaks Career Development Campus, 6375 Harrison Ave., Cincinnati OH. This facility is located just east of I-275 and I-74. Take I-74 to the Rybolt Rd./Harrison Ave. exit (exit #11). Go east on Harrison Ave. Diamond Oaks is located on the right (south side) of Harrison Ave., less than one mile from the I-74 exit. Special seminars, transmitter hunts, indoor vendors (setup Friday 5 p.m.–7 p.m. and Saturday 6 a.m.–8 a.m.), outdoor flea market (setup 6 a.m. Saturday) — first space free with admission ticket. Additional spaces $3 each. Indoor vendors bring your own extension cords. Electricity not available outdoors. VE exams at 8 a.m. Walk-ins accepted. Refreshments, free parking, handicapped parking available. Talk-in on 146.670(-) and 146.925(-) rptrs. Admission is $5 in advance, $6 at the gate, age 12 and under free. Indoor vendor tables (6 ft. with free electric) $10 each. Contact *Lynn Ernst WD8JAW, 10650 Aspen Place, Union KY 41091-7665.* Phone *859-657-6161;* E-mail *[wd8jaw@arrl.net].* Web *[www.ohkyin.org].* Expected attendance 650–750.

AUG 11

BAYVILLE NJ The Jersey Shore ARS will host their Hamfest August 11th at the Bayville Fire House, Route 9, Bayville NJ. Talk-in on 146.910 MHz PL 127.3, and 443.350 MHz PL 141.3. Setup starts at 6 a.m. and the doors open to the general public at 8 a.m. Admission is $5. Tables reserved in advance are $15 each, first come basis, includes one admission. Contact *Bob W2CE* at *732-657-9339* or *[hamfest@jsars.org].* VE exams registration is at 11:30 a.m.; testing starts at 12 noon.

AUG 17

OAKLAND, NJ The Ramapo Mountain ARC will hold its 26th Annual Ham Radio and Computer Flea Market on Saturday, August 17th, at the American Legion Hall, 65 Oak St., Oakland NJ 07436. Talk-in on 147.49/146.49 and 146.52 simplex. Vendors' setup starts at 6 a.m. The event is open to buyers 8 a.m. until Noon. The kitchen opens at 7 a.m. Donations $4. Spouse and kids admitted free. Inside tables $10 each. Tailgate space $8 per space. Please contact *Steve Oliphant N2KBD, 10 Glen Rd., Ringwood NJ 07456-2331.* Phone *973-962-4584,* fax *973-962-6210,* Club E-mail *[rmarc@qsl.net].* Visit the Web site at *[www.qsl.net/rmarc].*

AUG 25

DANVILLE, IL The Vermilion County ARC will hold their 2002 Hamfest August 25th at the Vermilion County ARC clubhouse, Woodbury Hill Rd., Danville IL. For more info contact *Terry Powell KB9REE, Vice President, V.C.A.R.A., P.O. Box 80, Catlin IL 61817-1007.* Phone *217-446-1379,* or E-mail *[KB9REE@YAHOO.COM].*

OCT 5

WARSAW, MO The Twin Lakes ARC will sponsor the Warsaw MO Hamfest Saturday, October 5th from 9 a.m. to 4 p.m., at the Warsaw Community Bldg., one block west of the square. Talk-in on 147.300 on the Warsaw rptr. Setup is at 5:30 a.m. Admission $2 at the gate. 8 ft. tables $10 each (hurry, only 30 available). Breakfast and lunch will be served on site. For more info call *Gene* at *660-438-8650,* or E-mail to *[gpo@advertisenet.com].*

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SPECIAL EVENTS, ETC.

JUNE 8

BEDFORD, VA The Roanoke Valley ARC and the Franklin County ARC will operate special event station WW2DDM on June 8th, commemorating the first anniversary of the dedication of the National D-Day Memorial in Bedford, VA. WW2DDM will be on the air from 1400–2400 UTC on 80, 40, 20,15, 10, 6, and 2 meters on CW, SSB, PSK-31 and RTTY. For a QSL card, send SASE to *Charlie Beckwith K4BSF, 563 Buzzard Rock Ln., Rocky Mount VA 24151-4844.* For more info visit the Web site at *[www.qsl.net/www2ddm].*

JUNE 8–22

RICHLANDS, NC The Onslow ARC, WD4FVO, will operate 1300Z June 8th to 2100Z June 22nd, to celebrate the opening of the North Carolina Opry and relocation of the WSMO studio. Transmission on local 2-meter FM, and HF 10–80 meters (excluding 30, 17 and 12). Certificate/QSL, *OARC, P.O. Box 841, Jacksonville NC 28541-0841.*

JUNE 24–30

HAGERSTOWN, MD The Antietam Radio Association of Hagerstown MD will celebrate its Golden Anniversary (50th) with Station W3CWC operating June 24th to 30th. Listen near 7.240, 14.240, 28.440, 50.140 and locally on 147.090 MHz at various times during this special event. For a certificate, send QSL with contact information and a #10 or larger SASE to *Antietam Radio Assn., P.O. Box 52, Hagerstown, MN 21741-0052.*

JULY 13, 14

LAKE CHELAN, WA Special Event Station W7H will be on the air from the shores of Lake Chelan from 00:00 UTC on July 13th until 23:59 UTC on July 14th. The Lake Chelan Radio Club (K7SMX) is sponsoring this event to commemorate the "World Hang Gliding Championships" being held over 10 days at this location. Listen for W7H on or near the following frequencies: 3.875, 7.250, 14.275, 21.325, and 28.450 MHz. Send an SASE for a special QSL, or $4 for an 8 1/2 x 11 inch unfolded certificate to *Lake Chelan Radio Club, P.O. Box 1445, Chelan WA 98816-1445.* For more details visit the club Web site at *[http://www.lakechelanradioclub.com/].* 73

On the Go

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/Ø
16717 Hickory St.
Omaha NE 68130-1529
[ke8yn@netzero.net]

Top Secret

Why do amateur radio operators insist on making our hobby and service such a big secret? You'd think that it was a matter of national security. Maybe we just don't want to share, or maybe we think that we're that elite. For whatever reason, we aren't sharing our story very well.

On March 14th, *USA Today* had an article on the competition for frequency space. They pointed out how there is such a demand for additional frequencies for new technologies that are emerging. Some areas of the country have some pretty significant demands, but there isn't the economic base to support the bidding wars that occur. A new wireless service in California can justify significant front-end investment, but a basic communications service for Alaska wouldn't. The article stated that the expected cost to acquire frequencies for a mobile phone service would be $800,000.

As *USA Today* commonly does, the article included a graphic, in this case a spectrum showing what activities occupy particular frequencies. Television and FM broadcast radio were included as were cell telephone, garage door openers, and baby monitors. Citizens Band was there, as well as Automated Teller Machines and Global Positioning Satellites. Ham Radio was conspicuous by its very absence.

Now some might argue that it is good to keep a low profile when the topic is spectrum allocation, but I tend to disagree. The public does not clamor to have baby monitors taken off the air to free up frequencies for other uses. Of course, the other side is that they do tend to see a value in baby monitors. Do they see value in ham radio? They might, but they have to first know that it exists before they see any value in it. We need to make sure that people see and understand the value that ham radio has to them. The fact that it has value to us doesn't matter — it has to demonstrate a value to the average person on the street: the very people who never read *73 Amateur Radio Today*, but do read *USA Today*.

What should we tell these people and how should we tell them? As I've pointed out in some recent columns, there are good ways to publicize our benefit. I was very pleased to have quite a number of readers send me their thoughts on this. Thanks to everyone who dropped me a note. Generally, most folks who wrote were in agreement with some of the key points of the article. As usually occurs, the ideas they shared with me were more interesting than what I included in the original article! That's the reason that I appreciate the feedback.

Several folks pointed out that the ARRL could or should do more to promote the image of amateur radio. They have full-time staff, resources, and influential contacts. It just seems to make sense. Although the League has a role to play, I tend to believe that the local angle cannot be overstated. The greatest article or public service announcement has to get the attention of the editor at the local newspaper or television station. Local interest may be more important and the same type of story may get more attention if it has a local flavor. If amateur radio is to be appreciated, it will be because it has a value to this town. Unfortunately, when the tornado or hurricane hits, the news is going to be focused on the damage the storm caused, not how well amateur radio performed. Yes, amateur radio made a difference, but so did the Red Cross, the Salvation Army, the Police Reserve, the National Guard, etc. When the chips are down, many people stand up and help out.

Another interesting comment that was passed along was that public service agencies tend to build their power base on the budget they receive. As such, paid employees are a measure of the importance of the agency and volunteers are discouraged. Volunteers in many cases are seen as interference during normal operations, and won't have the benefit of experience for use in an emergency. The one area I have seen where this has taken a different direction is in Florida, where police and fire departments use volunteers for communications, and even a "Citizen On Patrol (COP)" auxiliary.

So what can we do? Let's start with a few philosophical ideas.

a. It's up to me. If each of us expects someone else to do it, we cannot guarantee that it will ever get done. On the other hand, if I decide I'm going to do it, I can ensure that things get done. This doesn't mean that they'll always be successful, but it does mean that it will at least get attempted. I believe that if I try often enough, sooner or later I can't help but succeed.

b. Have a positive attitude. Recently I contacted some hams about helping a hospital that has a specific role to play in a particular type of terrorist attack. Most of the hams were quick to offer to help. One, though, launched a dissertation as to why this would be illegal since it supported the hospital's business. I'm sorry, but I don't think anyone's normal business includes a disaster or an attack. We need to have and project the idea that we are ready, willing, and able to do whatever is necessary to help out our community in times of emergency.

c. Find a champion. Is there a member of the local ham club who is a police officer, fireman, or politician? See if they can help open some doors.

d. Choose a spokesperson. Is the news anchor the smartest person at the television station? Not necessarily, but he or she can present well. Choose someone who can do the same for your club or organization. As much as we'd like to believe otherwise, not every one of us can do this. We need to get our message across, not necessarily massage someone's ego.

e. Don't expect to be invited in the front door. Our story won't be on the front page

Continued on page 57

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083-5640

AMSAT Field Day 2002

It's that time of year again; summer and Field Day! Each year, the American Radio Relay League (ARRL) sponsors an emergency preparedness exercise called Field Day. The event takes place during the fourth weekend of June. Individual hams and ham clubs compete to make as many contacts as they can from remote locations using emergency power and portable stations.

For 2002, Field Day starts at 1800 UTC on June 22nd and continues till 1800 UTC on the 23rd (2100 UTC for those that begin setup no earlier than the beginning of the event). The Radio Amateur Satellite Corporation (AMSAT) promotes its own version of Field Day for operation via the hamsats, held concurrently with the ARRL event.

While the ARRL [http://www.arrl.org] rules provide a 100-point bonus for the successful completion of a single amateur-radio satellite contact, the AMSAT rules promote activity on all of the current operational satellites. The AMSAT [http://www.amsat.org] rules worked well last year, and show only minor changes this time.

The congestion on UO-14 and AO-27 was so intense in 2000 that rule changes for 2001 allowed only one contact per each FM, single-channel satellite. Even with the change, those stations with dual-band HTs using simple whip antennas didn't have much success, but more folks at least got a chance to make a contact. Once again, stations that have completed their single contact via a particular FM satellite are encouraged not to make any further contacts via that satellite during the Field Day period.

The big change for 2002 is the addition of voice contacts with the International Space Station. Like the FM satellites, only one contact is allowed per station for the duration of the event. One digital contact via the ISS packet digipeater or PCSat (now Nav-OSCAR-44) is also allowed. In March 2002, NO-44 was having significant power problems, so it is questionable if it will survive long enough to be available for Field Day, but packet via ISS is expected to be active.

The first-place, emergency-power/portable station will receive a plaque at the AMSAT General Meeting and Space Symposium in Fort Worth, Texas, November 8–9, 2002. Certificates will be awarded for second and third place, emergency-power/portable operation in addition to a certificate for the first-place home station running on emergency power. Stations submitting high, award-winning scores will be requested to send in dupe sheets for analog contacts and message listings for digital downloads. Check the AMSAT Web page for details and a sample entry form.

There are some good reasons to consider participating in the AMSAT event if you are serious about chasing satellites on Field Day. The AMSAT rules recognize the individual hamsats as separate bands, thus promoting the pursuit of all of the "birds" for the duration of the event. AMSAT also encourages digital satellite activity. Special Field Day messages are sent to the "digisats" for download points by anyone who can receive them. It's even possible to participate in the AMSAT event and get points without a license. While monitoring the downlink from the digisats, complete short Field Day Greeting messages can be received without ever transmitting.

Making choices

It would be nice to try to work every active hamsat in the sky on Field Day, but it's just not possible without a lot of gear and a lot of club members or active participants in the satellite chase. The best thing to do is to pick satellites that have transponders, either analog (voice and CW) or digital (1200 or 9600 baud), for which you have equipment.

If you are considering ONLY the FM voice satellites like UoSat-OSCAR-14 or AMRAD-OSCAR-27, don't, unless you are simply hoping to make one contact for the ARRL rules bonus points. Even with the rule changes for 2001, the FM voice satellites turn into a solid FM-repeater pileup during Field Day. It's fun listening, but that's not what Field Day is all about. Diversify. Gear up for other voice/CW hamsats.

If you have worked the satellites on Field Day in recent years, you may have noticed that a lot of good contacts can be made on some of the less-populated, low-earth-orbit satellites like Fuji-OSCAR-20, Fuji-OSCAR-29, and RS-12/13. During a typical workweek, contacts are few and far between, but during Field Day the transponders come alive like 20 meters on a weekend. The good news is that the transponders on these satellites will support multiple simultaneous contacts. The bad news is that you can't use FM — just low duty-cycle modes like SSB and CW. AMSAT OSCAR-10 can also be a lot of fun on Field Day if the solar panels are properly illuminated and it is in a good position in the sky for Field Day. Plot some orbits and check it out.

This will also be the first year for AMSAT OSCAR-40 on Field Day. Predictions show good opportunities during Sunday morning hours. Satellite enthusiasts have been waiting for this moment for a number of years. It's here. Make the most of it!

Equipment

The best radios for Field Day are the ones you use at home, unless of course, they are heavy antiques. If you have one of the newer, all-mode HF/VHF/UHF transceivers, take it with you. If you don't have one, find someone who does, and borrow it. Be sure that it can transmit on the satellite uplink band while simultaneously receiving the downlink band. Practice prior to the event. There's nothing worse than trying to figure out a strange radio while you are

hunting for a satellite, keeping tabs on uplink and downlink frequencies, and adjusting for Doppler — all at the same time. Have a backup station. During one Field Day event, our group had to dig out the backup to the backup due to power problems.

Be prepared to at least work SSB and CW on Mode J (two meters up and 70 cm down) via the Fujis. With a nice set of two-meter and 70-cm directional antennas, AO-10 Mode B (70 cm up and two meters down) can be a lot of fun on a good day. A station that is ready for AO-10 is just a small step away from Mode U/S via AO-40. The 70-cm uplink for AO-10 will do fine for AO-40, and the two-meter receiver can be used as the "IF" or intermediate frequency for an AO-40 S-band downconverter. There are now many easily converted, and cheap downconverters available. Check out [http://members.aol.com/k5oe/] for some ideas.

Unless you have experience with low-power satellite work, don't try satellite "QRP" on Field Day. It's really hard even for the best satellite operators, and can be quite difficult and disappointing to demonstrate to potential newcomers. There are too many inexperienced satellite operators on the air during Field Day and many are trying to deal with noisy generators, bugs, and unfamiliar radios. Listening for weak stations is too much to ask.

Antennas

A simple system for RS-12/13 or RS-15 Mode A can get by with a dipole in the trees for 10-meter reception and a ground plane in the clear on the two-meter uplink. Most serious satellite operators will have an antenna system that will rival many home stations', with large circularly-polarized Yagis positioned by azimuth and elevation rotors. Something in between these extremes should suffice. A small dish with S-band downconverter can easily be included in any medium- to large-size satellite array designed for two meters and 70 cm.

Predictions

Don't assume that you can take a laptop computer to Field Day and do your predictions after you get there. Plot all of your potential satellite passes in advance for every satellite you intend to pursue. Check the results. Look for timing conflicts. Instant Track 1.50 from AMSAT provides some scheduling functions that will help, and it runs on almost any PC. Make sure that the coordinates of the Field Day site and recent satellite element sets have been entered into the software. Don't forget to take along some satellite frequency guides — unless you are one of the few that has memorized all the uplink and downlink bands for all of the operational hamsats in orbit.

Also check the operating status of your target satellites prior to Field Day. For example, RS-12 and RS-13 have occasionally been switched into Mode K (15 meters up and 10 meters down) and Mode T (15 meters up and two meters down). Be ready for surprises.

Power and interference

There is nothing worse than having all the gear, antennas, predictions, and accessories ready to go, and then discovering that you can't hear anything but noise on the downlink frequencies. It happens a lot. Noisy power sources are the number-one culprit. If you can operate with batteries, do it. Satellite chasing is considered weak-signal work. Most of our hamsats only have a few watts' output to simple antennas. They can be hard to hear. A typical consumer-grade gasoline generator can produce a lot of noise in the RF spectrum. Be sure to test your generator prior to Field Day. Check it with your satellite rig for a few passes. If it is noisy, either cure the problem or get another power source.

Don't forget about "the other guy." Most Field Day operations include multiple stations for HF, VHF, and satellite work. The folks in the tent next door on 10 meters can ruin your best attempts to make Mode-A contacts. Coordinate with them so that they can go to another band or take a break during those short intervals when the RS hamsats come by.

If your group operation has any terrestrial VHF stations or two-meter packet systems, they can destroy any chances you might have had hearing AO-10 on Mode B with its two meters downlink. As with the HF folks, make your intentions known and arrange for an operating schedule, in advance. Even with all these precautions, it is always a good idea to isolate the satellite station from the others. A high-power 20-meter SSB rig will almost always mess with a 10-meter receiver just a few feet away.

There are even a few potential interference problems associated with S-band reception of AO-40. Microwave ovens and wireless 2.4 GHz devices like wireless LAN cards and portable phones are at the top of the list. It is doubtful that there will be a problem, but check first! A lot of mobile homes have microwave ovens, and hams tend to be techno-geeks who collect new toys just to see what they will do.

Have fun!

You may have multiple rig difficulties, antenna failures, computer glitches, generator disasters, tropical storms, and even satellite problems, but the goal is to test your ability to operate in an emergency situation. Try different gear. Demonstrate satellite operations to hams who don't even know that the hamsats exist. Test your equipment. And finally, have fun doing it!

The ARRL Field Day hamsat rule

The following item is from the American Radio Relay League Field Day rules at the ARRL Web site.

7.3.7. Satellite QSO: 100 bonus points for successfully completing at least one QSO via an amateur radio satellite during the Field Day period. Under the "General Rules for All ARRL Contests" (rule 3.7.2.), the no-repeater QSO stipulation is waived for satellite QSOs. Groups are allowed one dedicated satellite transmitter station without increasing their entry category. Satellite QSOs also count for regular QSO credit. Show them listed separately on the summary sheet as a separate "band."

The AMSAT Field Day Rules

The AMSAT Field Day 2002 event is open to all amateur radio operators. Amateurs are to use the exchange as specified in the ARRL rules for Field Day. Note that no points will be credited for any contacts beyond the ONE allowed via each single-channel FM satellite. Operators are encouraged not to make any extra contacts via these satellites (Ex.: UO-14 & AO-27). CW contacts and digital contacts are worth three points as outlined below.

1. Analog Transponders.

a. Each satellite transponder is considered a separate band.

b. All phone QSOs and all CW QSOs on a given satellite transponder are considered separate bands.

c. All packet/RTTY/ASCII/AMTOR QSOs through analog transponders are counted as CW QSOs for scoring purposes.

d. Phone QSOs count for one point and CW QSOs count for three points.

e. Cross-mode (CW/phone) contacts are not allowed.

f. Only one contact is allowed via each single-channel FM satellite, UO-14 (1 phone), AO-27 (1 phone), ISS (1 phone and 1 digital), PCSat (1 digital).

Continued on page 57

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
[Wb6igp@ham-radio.com]
[clhough@pacbell.net]

The Qualcomm 2.x GHz to 10 GHz Multiplier

This project was started last month, and describes a local oscillator system consisting of a 2 GHz frequency-agile synthesizer. This synthesizer is capable of providing to many frequencies from 2.3 to near 2.8 GHz in either 2 or 5 MHz steps.

The original unit was programmed for operation at the spot frequency of 2620 MHz and multiplied to 13.1 in the multiplier. This multiplier unit can be converted easily by retuning the stripline elements to a lower frequency for many different applications, including local oscillators for 10 GHz transceivers and 12 GHz schemes for 24 GHz applications. Many other uses are also possible and are left to the designer's imagination. These include many possibilities in the 2 GHz frequency range as fundamental frequency operation for 2304 MHz or AO-40 uses.

Let's get into the meat of this month's modification, the multiplier board, and my thanks to Ed Munn W6OYJ and Kerry Banke N6IZW! Without their help and assistance, this project would not have taken form.

Originally, this board was used at a frequency of 13.1 GHz, with an input of 2620 MHz. Retuning of stripline elements and filters is required to lower resonance of these filters to the new desired frequency. Techniques required involve making some tuning tools, which are constructed from round toothpicks cut at a diagonal at one end to remove the sharp point, and superglue a small bit of copper to the oval cut end of the tooth pick. Several different sizes of tuning tools are constructed to provide a range of adjustment tuning strips consisting of different sizes of copper bits.

In actual use, power up the board with DC power and RF drive at the new frequency. Test the line lengths of each filter element and tabs on the multiplier to see if adding a bit of copper to each element in the filter can make improvement. If the power as observed on a power meter increases, find the "sweet spot" for max power increase and then power down, noting where a bit of similar size can be soldered to the spot determined by experiment and duplicating the toothpick-size bit. Apply power and see if similar power is obtained. If not, readjust the soldered bit by repositioning it with power off. Reapply power and retest till no increase in power can be obtained. If power drops when placing a tool with a bit of copper near the element being tested, decrease the copper soldered bit or line length with an X-acto knife and retest for increase in power. We call this procedure "snow flaking." Take your time and don't short out other parts to the element being tested. Once the smoke is let out of a device by shorting something out, it's hard to put the smoke back in. Hi.

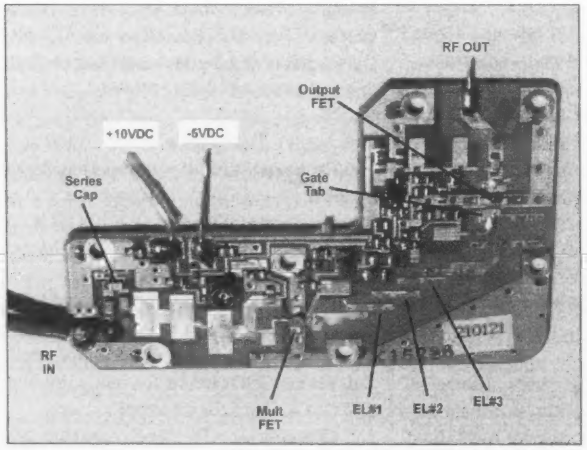

Photo A. *Qualcomm multiplier showing DC power, RF ports and the 4th harmonic filters that need modification to their length. The filters to modify are EL1, 2, and 3. They are extended on right side of filter toward the open section of board, which gives access to allow the added length of the filters. Measure exact length starting from leftmost section of element and mark end on rightmost side of filter element for proper length of new filter frequency.*

First, some technical specifications concerning the Qualcomm multiplier. The PC board is set for 2.620 GHz times 5 to 13.1 GHz, with a drive level at 2 GHz of +10 dBm, and provides about +7 dBm output power at 13.1 GHz. The PC board is quite small, measuring 1-5/8 inches by 2-3/4 inches. The board is populated with two stages of MGF-1302 FETs and two DC control transistors, one for each FET. The first stage multiplies to 13.1 GHz, driving a stripline filter to the second-stage power amplifier. DC power requirements are minus 5 volts bias and plus 10 volts DC. (When powering, be sure that minus 5 volts is applied first before the +10 DC.)

The multiplier PC board is quite small, and having a notch in the PC board 3/4 x 1-1/2 inches in size allows a small internal negative power converter to use this open space. This power converter would provide negative voltage generation of 1 mA or so, driven by the +10 voltage regulator, allowing the PC board to be self-contained operating from +12 volt DC supplies. I still have not made this modification to my unit as shown in the photos as I apply bias (–5 V) and +10 volts externally to my units.

Add two SMA coaxial connectors for input and output and that finishes the package. This board is a natural to drop into a milled

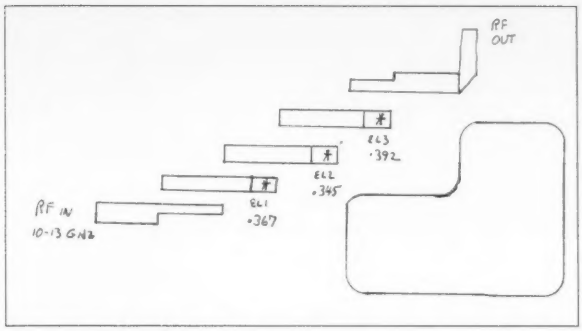

Fig. 1. Filter modifications. Drawing showing where to place copper extension elements to stripline filter for new frequency desired. Lengths shown for 10224 MHz; very functional at 10368 MHz also.

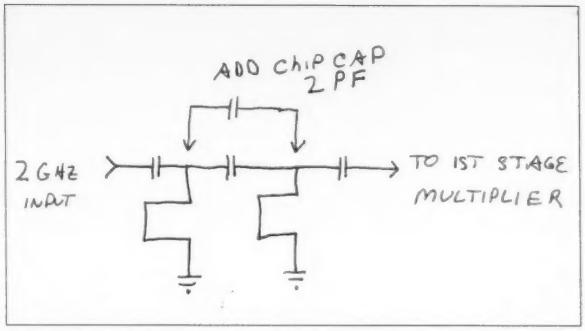

Fig. 2. Input filter. Drawing to show where to add piggyback chip cap to existing 2.620 GHz filter to improve lower frequency performance at 2592 MHz.

housing for frequency multiplication schemes in the 10 to 13 GHz frequency ranges. Other solutions for containers or simple box construction will be described later. Also, just for mention's sake, there was an earlier older version of this PC board that used a different modification filter scheme. This much larger PC board used a 1-inch copper pipe cap filter in place of the stripline filter used on the new smaller board. This larger older PC board was covered in a 1994 *73 Magazine* article. Having a smaller multiplier is much more desirable than the older larger unit. Not only size improvements but also more efficient stripline filters make for a far better package profile in this conversion.

The modification

A 2 pF chip cap is required to modify the input filter at 2592 MHz. Modifications to the multiplier circuit filter consist of extending the filter lines with strips of copper soldered to the stripline filter elements. This retunes the filter for best output at the 4th harmonic for a 10 GHz LO. The filter element lengths described in this conversion are optimized for 10224 through 10368 MHz. For other frequencies, some length adjustment will have to be altered accordingly for that new frequency. Typical output power can be +4 to +8 dBm. This, of course, depends on drive and retune success.

The conversion consists of adding the 2 pF chip cap soldered on top of the existing input filter "SERIES" chip cap (NOT THE SHUNT CAPS, WHICH GO TO GROUND). This will lower the filter frequency from its original frequency of 2.620 GHz to something in the 2.592 GHz range. This filter is connected directly to the 2.5x GHz RF input coax line. Next, extend the filter elements located between the first stage multiplier output to the second stage amplifier input. The length of the 1/2-wave filter elements is modified by adding copper extensions to the open side of the filter elements only. The element lengths are, from left to right: EL1 = 0.367 inch, EL2 = 0.345 inch, and EL3 = 0.392 inch for best output in the 10.224 to 10.368 GHz region. Additionally, add a small snowflake size determined experimentally for best overall multiplier output on the gate of the FET amplifier. Experiments dictate that for best performance this snowflake locates on the gate of the amplifier stripline toward the resistor marked "510". Adjust size for best gain at the output of the multiplier PC board.

Power for the multiplier is –5 volts bias at 1 mA approx., and +10 volts DC. The same voltage regulator power supply for the synthesizer can be used to provide the +10 volts required for the multiplier board. A surplus power supply board is used to provide the required +10 volts and –5 volts bias feeding both PC boards.

In **Photo B**, the completed marker synthesizer unit is shown. It functions on 2592 MHz with a power output of +10 dBm. This port drives the multiplier conversion to produce some amplified power at 10.368 MHz, the 4th harmonic of 2592 MHz. Additionally,

Continued on page 58

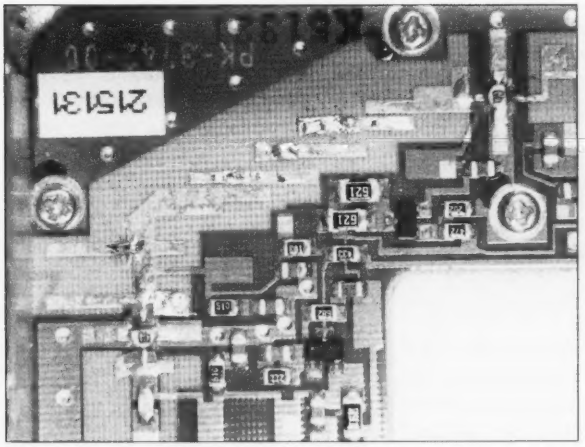

***Photo B.** Close-up of filter modification length adjustment soldered onto PC board with same-width copper strip to extend length of 1/2-wave filter.*

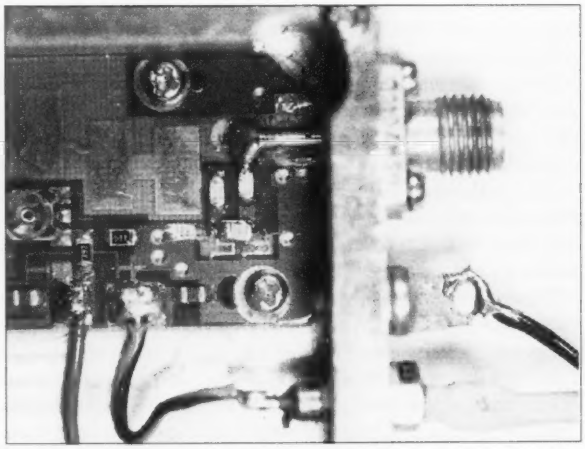

***Photo C.** Close-up of input filter with chip cap added on top of the existing filter chip cap.*

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØOV
PO Box 2508
Fullerton CA 92837
[Homingin@aol.com]
[http://www.homingin.com]

Transmitter Hunting as a Public Service

Hams serve the public in many ways. VHF and repeater enthusiasts coordinate parades, races, and every kind of "-thon" imaginable. ATV and packet fans help out with their special equipment. DXers provide communications for foreign countries after earthquakes and other disasters. What about hidden transmitter hunters?

Your radio direction finding (RDF) skills could be of benefit to your fellow hams and neighbors, and the other citizens of your community. Over the last 13 years, "Homing In" has chronicled the good works of T-hunters as they tracked downed aircraft, solved interference from defective equipment, and tried to keep their repeaters free of jammers. Right now, one Internet foxhunting group mailing list is busy with discussions of joint exercises with the Civil Air Patrol. The "Homing In" mailbag (electronic and postal) is full of input from hams who are pitching in.

The first example comes from frequent contributor Tom Lewis AB5CK, who wrote to say that the problem of long-range unlicensed cordless telephones came to Fort Worth, Texas, last November. Hams began overhearing very personal conversations on 145.12 MHz, with no identification. "Using RDF equipment, the signal was tracked to a home in northwest Dallas," he wrote. "That was more than 18 air miles from our starting point in Fort Worth. The phone's performance was enhanced by a chimney-mounted scanner-type antenna fed with small coax. This provided the owner with high-quality conversations as he drove around the Dallas area.

"We contacted the Dallas FCC Office and presented a copy of the *ARRL Letter* issue that asked FCC to investigate long-range cordless telephone sales," Tom continued. "FCC responded quickly, verified the location of the unlicensed transmissions, and contacted the party using the equipment. Less than two weeks later, the offending device was surrendered to the FCC. It was made by Delta International in Taiwan. The owner was overheard saying he purchased it from a business in Arkansas."

Jingling spurs everywhere

How many blockhouses full of commercial, government, and amateur radio gear are on hilltops in your area? Most remote transmitters operate for decades with no problems, but when one malfunctions, it might not be apparent to the owners. Instead, it may become a mystery signal that affects other spectrum users. Ken Thompson NØITL of Wichita, Kansas, wrote with an example. He has been doing RDF for many years, catching jammers and chasing radio-equipped balloons launched by his local club. He prefers his Roanoke Doppler RDF set,[1] which he has equipped with separate antenna systems for VHF (two meters) and UHF (70 cm and above). **Photo A** shows the sturdy UHF Doppler array that he recently finished.

Ken wrote, "On a hot Saturday evening of late, the scanner in my garage heard a continuous tone signal coming through the Wichita 146.85 machine with no identification. It was heard on the input side, but just as I got RDF gear set up, the signal went away. The repeater's technician told me that they had been hearing it for a couple of weeks, so I waited until the next day and listened again, with success this time. The signal was very weak into my RDF equipment, but good enough to get a general direction. After one detour, I was able to drive right to the source.

"The spurious emission went away before an engineering contact for the site could be met. But it appeared again at a higher frequency. It was bringing up 146.85 for only a while each evening because it was sliding up in frequency as the heat of the day went away. It was at 146.25 at 8:00 p.m., and by 11:00 it was up to 146.61. Contact was eventually made with the duty person at the site, but together we could not isolate the source inside the building. The strongest signal was coming from the tower.

"The site has two other major customers, one with a separate building on the property. The engineer for that transmitter was contacted the next morning and agreed to meet at noon at the site. It only took him a minute to find and turn off a malfunctioning studio-transmitter link (STL) radio."

Then there was the E-mail I just received from Clint Turner KA7OEI of West Jordan, Utah: "One of our repeaters was being triggered every 42 seconds or so with low-level Bell 103 tones on the audio. We put out the word and sure enough, someone reported hearing it on the input.

"It turned out to be a 173.625 MHz telemetry transmitter on a water tank. It also put out a strong spur in the 158 MHz area, in addition to the 146 MHz area. The fact that it was nearly 40 miles away, geographically obstructed from the Salt Lake area, and on a yagi, made RDF more difficult. We used signal strength (using my FT-817 in USB mode) as well as a Doppler RDF set. Another local ham visited the site in daylight with a service monitor to verify the presence of the actual signal, as well as see the other spurs and make signal strength measurements."

Calling Dr. Jones!

Those spur-tracking tales bring to mind a similar problem a few years ago in Los Angeles. At that time, most open repeaters had carrier access, with no requirement for subaudible tones on the input. Users were used to occasional "kerchunks," but several repeaters began to experience them regularly, often with snatches of medical-related messages in the audio. Monitoring on the input range revealed that a spur

from a paging transmitter was slowly sweeping from 146.4 to 146.2 MHz on every transmission, bringing up repeaters as far away as Running Springs in the San Bernardino Mountains.

Apparently a lot of paging was going on, because there were a lot of these sweeps. It was worst in the late afternoon, making us suspect that the transmitter was in a room that got hot that time of day, bringing on the spurs. While following the sweeping spur with one receiver, I used a scanner to check all the authorized paging frequencies for southern California. Sure enough, exactly the same paging audio was on 171.3875 MHz, which was licensed to the Veterans Administration hospital in west Los Angeles.

After using RDF to confirm that the spur was indeed coming from that site, it was time to make contact and get the transmitter fixed. That's when the frustration began. "No problem," said the hospital's Communications Manager. "Here's the number of the dealer. We have a service contract, so just explain the problem and they'll fix it."

That sounded easy, until the manufacturer's representative told me that the contract only covered routine services. "This problem requires replacement of the transmitter, which the contract doesn't cover," he explained. "We sent them a memo to that effect."

At that point I became a reluctant intermediary in the middle of the dispute between a government agency, its radio service contractor, and the transmitter manufacturer. The hospital had no incentive to solve the problem without prodding, because its own radios and paging weren't being adversely affected. Administrators didn't seem to mind that their private medical messages were being retransmitted all over the southland. So I had to keep calling the various players, getting responses such as —

Hospital Communications Manager: "We wrote a purchase order for the new transmitter."

Service Contractor: "We haven't gotten any purchase order."

Telecommunications employee replacing vacationing Communications Manager: "There's no purchase order on file."

Hospital Communications Manager upon return: "The purchase order had an error and had to be rewritten."

Service Contractor: "Not only do we not have a purchase order, we haven't even been told to expect one."

Hospital Communications Manager: "The purchase order is rewritten and is probably in the signature chain."

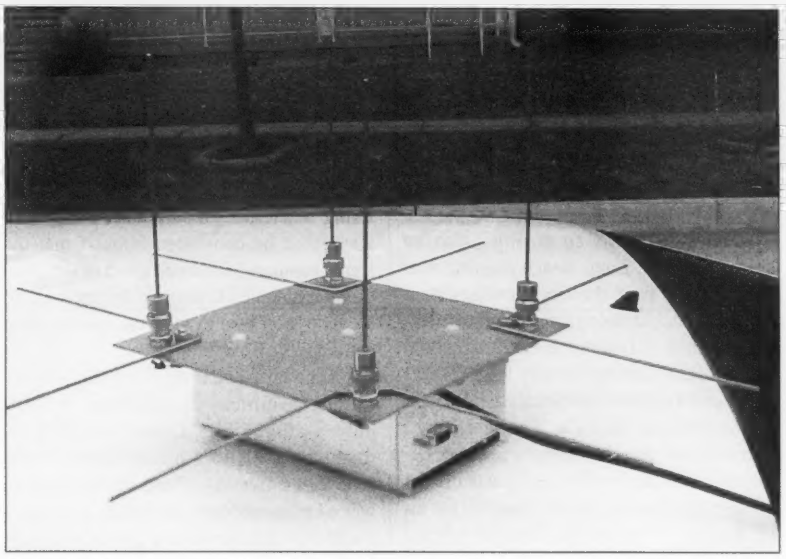

Photo A. *Ken Thompson NØITL built this wide-range Roanoke Doppler antenna array for UHF. He eliminated the lugs holding the radials to make it more rugged. (Photo by NØITL)*

Contractor's Receptionist: "He's out today."

Communications Manager's Secretary: "She's too busy to talk to you."

Now if I had a leaking water pipe on my property that was flooding my neighbor's yard and filling his basement, the neighbor would have no trouble getting local government to force me to stop the flood in minutes, not weeks, whether I had a service contract with a plumber or not. Similarly, you would think that hams whose repeaters were being "flooded out" could get authorities to force the VA to fix its interfering transmitter immediately or shut it off. But, as they say, "Who ya gonna call?"

What about the FCC? Yes, I tried. The local Engineer-in-Charge told me that the FCC doesn't have licensing authority over government agencies, so he couldn't issue a notice of violation. Another dead end.

After many weeks, the problem was finally fixed. Calls to doctors and nurses no longer rang out through southern California repeaters. This was before Riley Hollingsworth began handling ham matters in Washington. With that in mind, I wonder if a fix would have come faster if the same problem happened again today.

What's a DGPS RTK?

I confess that I'm a bit envious of Ray Grimes W6RYS because he gets to hunt transmitters in the line of duty as a Senior Staff Engineer for Motorola. It seems as if all of his hunts have interesting twists to them. For instance, he just wrote, "I got involved with an 800 MHz interference problem where antenna flashing light displays were found in cellular stores and kiosks at shopping malls. The imported demonstrator units for these little antenna-top bulbs could wipe out cellular and public safety radios for a block radius. My customer purchased one of these demonstrators and gave it to the Cerritos (CA) FCC office to examine." FCC-Washington issued a notice banning them shortly thereafter.

W6RYS has also located several interference-producing wireless local area networks (LANs) for in-building coverage that were connected to outdoor gain antennas atop tall structures. One affected five cellular sites and fire department radios throughout a two-mile radius. If you have 800 MHz QRM in your area, these are the type of emissions that you may have to hunt down.

Ray recently returned from Salt Lake City, where he was a member of the Utah Communications Agency Network (UCAN) Interference Reduction Team (IRT) for the Winter Olympics. IRT members came from Motorola, the cellular carriers, local and state governments of Utah, the FCC, and the Secret Service. "Thanks to two years of preplanning and RF engineering efforts by the UCAN team members, we had relatively few RFI problems, considering the many RF sources operating in the area," he reported.

Most interesting to me among Ray's recent interference chases was one that he and Jim Carter WB6HAG took on in Irvine, California. This report is courtesy of *Net Control*, the excellent monthly publication

of Orange County RACES. Ray is Chief Radio Officer for that organization.

"For several weeks, a city's public works repeater was plagued with signal bursts on its input frequency near 456 MHz. Each burst lasted about a second, with an interval of about a second between them. There was a brief tone at the start of each burst.

"The signal was so strong as to be copyable at the Long Beach airport, over twenty miles from the city. Bearings were inconsistent, indicating lots of signal reflections, which is typical of UHF signals in urban terrain. Orange County RACES was requested to assist in locating the source.

"According to W6RYS, 'The interference was only on the air during weekdays between 7 a.m. and 4:40 p.m. It was off the air on a Monday holiday and also off the air on another Monday and Tuesday when I wanted to hunt it.'

"Strong signals were present in downtown Santa Ana and near Irvine Medical Center, but several days of ghost-chasing there provided only frustration. Then Ray noticed that the signal was especially strong on the south side of the hospital tower building and in the industrial park to the east. It was even greater on the 405 freeway under the Laguna Canyon Road overpass, which was closed for construction.

"Ray drove through the construction area on the south side of the freeway two times, to the limits of his vehicle on the bad roads. Using a scanner, directional antenna and attenuator, he convinced himself that the signal emanated from due south of the Sand Canyon Avenue off-ramp of the freeway. So his next step was to visit the construction company's office trailer.

"When he asked if the company had any UHF transmitters in operation, the employee offered him a ride in a truck on rough-cut trails to a hilltop about a mile south of the freeway. There, out in the open, was a Leica outdoors-rated GPS receiver, a Pacific Crest Corporation (PCC) 35/2-watt UHF data link transmitter, a quarter-wave antenna on a 12-foot PVC mast fed with RG-58/U, and a 12-volt truck battery, all assembled on a tripod.

"'The employee said that this was their GPS differential correction system,' Ray explained. 'They use it to precisely plot areas to be graded and to direct heavy equipment for contour-grading tasks. The employee shut off the UHF transmitter and the public works repeater interference ceased. He explained that the reason that the transmitter was off the air on the Monday and Tuesday was that they were not able to grade on those days because of rain. He also claimed that the full 35 watts was necessary to produce a usable signal at their receiving locations.'

"Data links such as this provide construction and survey crews with much more precise location information than ordinary GPS does. They incorporate both Differential Global Positioning System (DGPS) and Real-Time Kinematic (RTK) technologies to achieve position errors of less than two centimeters. Data linked from the tripod-mounted GPS set at a carefully surveyed location makes automatic corrections to GPS satellite data received by a roving RTK-equipped grader or surveyor.

"Could this problem occur in your area? Pacific Crest is very careful to explain the need for legal operation of its data transmitters, which are synthesized and can be on VHF high-band or UHF. PCC's 44-page *Guide to Wireless GPS Data Links* and other application notes (available from [www.paccrst.com]) state that licensing under FCC Part 90 is mandatory, power must be limited, and the unit must be turned off when not in actual use. Approval by local frequency coordinators is required for operation on all business-band frequencies except those designated for 'itinerant' use.

"FCC licenses now being issued for DGPS RTK require carrier monitoring to prevent a data transmission when other signals are on the channel, plus automatic CW identification every fifteen minutes. All RTK links now being shipped from PCC have these features.

"PCC's guide recommends that buyers contact local commercial frequency coordinators, even for itinerant operation, and that they monitor the chosen channel with a scanner before putting the link on the air. But a scanner or low-altitude receiver may not pick up activity on the input of a public works repeater. And given the nomadic nature of the construction business, it's easy to imagine a RTK system being coordinated in one town and then being moved to another job or transferred to another branch of the construction company without re-coordination. So if you hear short signal bursts with strange tones on a UHF frequency in your area, be prepared for an interesting hunt."

All aboard for Slovakia

This is the absolute final call for applicants for Team USA to travel to the 2002 ARDF World Championships, September 2–7 at Tatranske Matliare in the High Tatras of the Slovak Republic.[2] Fourteen stateside radio-orienteers have already expressed strong interest in attending and competing. Their current ages range from 11 to 60.

Most of the limited number of team slots are full, but there may still be openings in divisions for females and youth. Team members are responsible for their own transportation expenses to and from Slovakia. Entry fees are due in full to the Slovakian organizers by July 15, to be forwarded for the team by the ARRL.

For the latest ARDF Team USA news, see the "Homing In" Web site. The postal and E-mail addresses for your inquiries, plus your news of RDF activities for fun and public service are at the beginning of this article.

Notes

1. Complete plans are in the book *Transmitter Hunting — Radio Direction Finding Simplified* by Moell and Curlee, published by TAB/McGraw-Hill, ISBN number 007-1560068. Updates are on the "Homing In" Web site.

2. Moell, "Homing In: USA's Foxhunters Take on the World," *73 Magazine*, April 2002.

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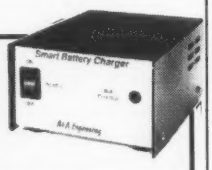

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Jack Heller KB7NO
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Carson City NV 89702-1792
[KB7NO@worldnet.att.net]

This Twist May Be for You

A little farther into this article you will see that I had a few days of what may be termed "computer stress." That is, I did not have a computer hooked to the rig in my shack's comfort zone. There were alternatives, but by the time I got through some operating system calisthenics, I was in severe need of a digital-QSO fix.

The best solution for this dilemma was to find something fresh and different to try. Just for a trip to revitalize the memory, I took a look at the listings in Dave's G3VFP listing (from The Chart), downloaded a truly different piece of software, and that was the beginning of a very fascinating trip.

Difference with a purpose

Did you ever want to click on a whole bunch of PSK31 signal traces and monitor them all at once? If you have, be careful what you wish for. I just installed the W1SQLPSK software, and many simultaneous signal decodes is just one of the available features. This was one of the most unique digital experiences I have had in a long while.

I had heard of this software for some time and managed to get busy at all the wrong times, so this was my first encounter. Such fun. You really can monitor every signal displayed in your waterfall simultaneously. I have to warn you, it will boggle your mind and keep it that way if you try for too many at a time.

Of course, there is a screen space limitation in that all these messages are going to display on single lines. I had heard comments that this made for confusion. However, the author has taken all this into consideration and made this multi-read exercise into a workable and pleasant experience.

It wasn't until I read through the brief Help file that I realized all these messages did not have to be one-liners across the monitor, one below the other. With a little mouse-clicking, you can put as many as you desire in their own little windows and adjust the windows to whatever size is convenient. However, when you do this with very many messages, you will wish you were displaying them on a big-screen TV. See **Photo A**. It tells a lot at a glance.

This program makes good use of the right-click of the mouse. When you right-click on a line of received text you get choices including expanding the line into its own window, making that channel the transmit frequency, parking (deleting the receive line), finding a callsign in the text, and clearing the window of text. It doesn't take long to get the hang of operation, and you just may become hooked.

What all this rhetoric means is I am writing this after the first rush from seeing so much available text that I could neither keep track of it nor keep the windows organized. And that is not because the author has not done his job to make it possible to keep everything organized. I think I have seen some young game players who could run circles around my efforts and take full advantage of many more windows than I have.

Before I go on, I will have to mention also that the program seemed to run flawlessly on my old 120 MHz 32M RAM setup with Win98. That speaks well for the software. You won't need a multigiga anything to let W1SQLPSK strut its stuff.

It transmits, too

After I got about a half a handle on the reception scheme, it was time to see how it drove the soundcard and be certain just where the transmit frequency was. The first part: It drove the soundcard perfectly, producing a PSK31 signal with zero ALC with the same setting as for the last digital program I had used in the computer.

With that worry out of the way, I did a little close observation and some Help file reading, and then opened my eyes to realize that there is a box that displays the "Xmit Freq" just a couple of spaces above the Receive window on the right side of the display.

Speaking of things such as PTT and Comm port settings, the Help file is very good about explaining this procedure. The setup is only slightly different than with software you are probably familiar with, and the instructions keep you out of trouble regardless of previous experience. So when I clicked the "Tune" button, the response was as expected and I could verify that the transmitted signal frequency was the same as the receive frequency by observing the waterfall.

The first time I tried this was much busier than when I made the screenshot, and I was not getting replies from the first few CQ calls I answered. Thinking perhaps I had an offset problem, I tried my own CQ and a ham came back as exactly on frequency as I could tell and we had an interesting chat. A little aside: He was running two or three watts and his signal from New Mexico was excellent to the very end. Sometimes I wonder why I habitually run 30 to 50 watts.

Great built-in log and callsign lookup features

This software is designed with a dual thrust. It is not only a good PSK31 program, but also contains some advanced log features that make tracking awards and call lookup smooth and straightforward.

Many of us use one of the several callbooks on CD that is automatically accessed by the many ham communications packages available when we click on a callsign. W1SQLPSK makes use of eCallBook, which is an up-to-date database available via the Internet. On the W1SQL

Continued on page 50

New Products

Zap Checker

The Alan Broadband Company has announced the Zap Checker, a high quality handheld instrument that detects and displays transmitted electronic energy. This new electronic device is comparable to a sensitive wideband receiver with signal strength indicators. The Zap Checker is distantly related to electric-field-strength meters of earlier days — but with orders of magnitude greater sensitivity and broader bandwidth than the older devices.

The usable bandwidth of the Zap Checker extends from 10 MHz to more than 4.50 GHz. The instrument detects even weak transmissions in this bandwidth from surprisingly long distances. Devices that use this bandwidth include cellular and wireless phones, microwave ovens, computer wireless devices, UHF, VHF, service band and ham transmitters, hidden "bugs" and surveillance equipment, baby and security monitors, FM and TV broadcasts, and even electronic car keys and garage door openers.

The Zap Checker is extraordinarily sensitive. It can detect cellular phones and covert bugs at more than 20 feet, transmissions from "sealed" microwave ovens at more than 40 feet, and from VHF and UHF transceivers at more than 80 feet. The detection of transmitted signals by the Zap Checker is limited by the background level of radiated signals — usually determined by baseline FM and TV transmissions in the area.

The high sensitivity enables you to tune up low-power QRP transmitters and determine antenna radiation patterns from a distance (avoiding detuning effects), to measure RFI signals and pinpoint RF leakage in cables, to locate hidden transmitters when foxhunting, to determine the optimum placement of computer wireless equipment, to monitor the radiation level at the baby's crib, to detect hidden cameras and audio bugs, and much more.

A manually adjustable sensitivity control adjusts the gain over a >20 dB range.

The Zap Checker also has unique detection and display systems. Detection is in logarithmic or linear modalities. In log mode, the dynamic range of the instrument spans a 1,000:1 signal range. In linear mode, the device picks up the weakest signals for a full display. Display of the transmitted signal readings is either by an analog meter or by illumination of colored LEDs. The LED display allows the measurements to be viewed from a distance or at nighttime. A switch-enabled silent vibrator mode is included for situations in which it is undesirable to view the displays directly (such as at the top of a utility pole or when monitoring covert transmissions at a meeting site).

The durable, portable Zap Checker operates on 2 AA alkaline batteries (not included) for more than 80 hours, weighs less than five ounces with batteries, and readily slips into pocket or purse. MSRP is $89, including S/H in the USA. CA residents please add 8% sales tax.

For further information, contact the Alan Broadband Co., Inc., 93 Arch St., Redwood City CA 94062; 1-888-369-9627; 650-369-9627; [www.zapchecker.com].

Never say die

continued from page 7

eliminating the need for most parts, and with electronic manufacturing now almost all moved to Asia, we no longer have electronic parts stores. Long gone are the days when every ham built stuff. The era of the appliance operator has gradually overtaken us. Electronic experimenting is a vanishing aspect of the hobby.

Gone are *Popular Electronics*, *Byte* and the other hobbyist magazines which didn't keep up with the times.

For those who enjoy wielding a soldering iron we still have a few kit suppliers such as Ramsey, MFJ and Hamtronics. But, other than that, the ham world has pretty much settled down to depending on Alinco, Yaesu, Icom and Kenwood to build their equipment for them.

So what does this mean for *73?* It clearly means either adapt or die. *73's* life or death is more in your hands than mine. Right from the beginning *73* articles were written by the readers, not professional writers. By hams. By guys like *you*! So sit down at your word processor and process for me.

What can you write about? Lordy! Tell us about the most exciting times you've had with the hobby. When you get a new piece of equipment, tell us all what you think of it. How much fun have you had with it? How is it great? What problems have you had? With the few advertisers that have stuck with us we don't have to worry about making most advertisers angry, that's for sure.

But I guarantee that every reader wants to know about new gear. They'll eat it up. We're now appliance operators and we want to get the best appliances there are so we can have fun with them.

We also want to know how much fun you've had on DXpeditions, or even getting up on a mountaintop and VHF DXing.

How about foxhunting? What equipment have you bought or built for that? Ever had any fun?

Is anyone other than W7DXX providing Internet access to our bands? How'd ya do it? What does it take? How much fun have your users had?

How about swapping digital photos? How can we best do this? What does it take? I have a digital camera and an iMac, now what do I do?

I'd love to have more Internet info. What clubs have newsletters available?

Continued on page 59

Advertisers' Index

R.S.#		page
•	A & A Engineering	46
•	Alinco	CV2
•	Alinco	CV3
•	All Electronics Corp.	13
•	Amateur Accessories	23
16	Astron Corporation	2
•	ATOC Amateur Distributing LLC	CV2
•	ATOC Amateur Distributing LLC	CV3
42	Bilal Company	23
168	Buckmaster Publishing	23
56	Buckmaster Publishing	26
99	Communication Concepts	29
•	Communications Electronics, Inc.	5
10	Communications Specialists, Inc.	19
•	D & L Antenna Supply Co.	26
13	Doppler Systems	30
193	GGTE	58
•	Ham Ambassadors	62
•	Ham Mall	19
•	Hamtronics, Inc.	9
•	Houston Amateur Radio Supply	26
42	Isotron	23
•	M²	58
•	Maggiore Electronics Lab	19
•	Michigan Radio	49
160	Micro Computer Concepts	46
•	Midland Technologies	24
193	Morse Tutor Gold	58
•	Omega Sales	24
•	Omega Sales	29
•	Radio Book Shop	7
•	Radio Book Shop	19
•	Radio Book Shop	24
•	Radio Book Shop	29
•	Radio Book Shop	34
•	Radio Book Shop	38
•	Radio Book Shop	58
•	Radio Book Shop	61
•	Radio Book Shop	63
34	Ramsey Electronics	3
•	RLS	7
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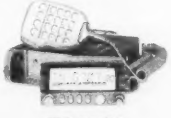
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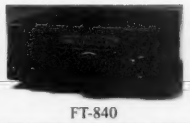
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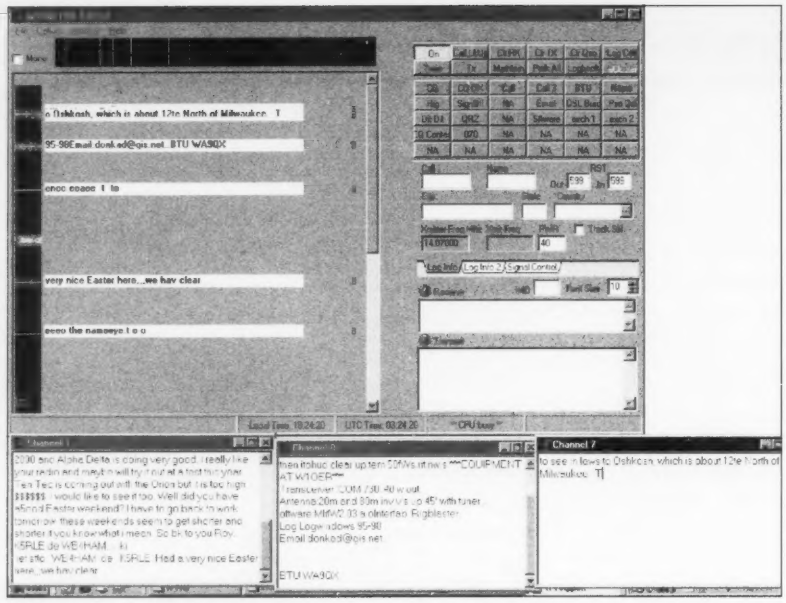

Photo A. *W1SQLPSK. Here is the program that has the capability to monitor 20 signals simultaneously. I picked a "slow" time of day for this shot and only selected five traces, then expanded three into their own windows. On the left is the waterfall, dubbed "waterspray." A few of the traces had disappeared by the time I had all this in order to shoot the screenshot. The windows across the bottom are individual text boxes. All four windows can be resized to fit your preference. Across the top is the spectral display good for 4-kHz width. The waterspray at the side can be explored by clicking the bar down the middle so you can see and receive whatever is within the bounds of your filter width. The width is approximately 2 kHz as shown. The lower frequency is at the top. The frequency of the trace you select (none selected for transmit here) is calculated and displayed as the Xmit freq and logged automatically at the end of the QSO. There are 11 predefined macros at the top, and the rest are for you to edit as you choose (instructions included). I used the samples as is and they were just what I needed. The other twist to this software is the ease of callsign lookup and award tracking. (See text.)*

The Digital Port

continued from page 47

Web site (see **Table 1**), I saw a note that the database can be purchased on disk, so you do not need to keep your Internet connection up and accessed all the time you are on the air. There is a subscription fee for the continuously on-line database access, but the claim is that it is more cost-effective than purchasing and updating by CD. The information says that the database includes ham calls worldwide and is growing.

In any event, it is another approach to call lookup to get essential information about your contacts as quickly as you can work and log them with this retrieved information. One of the subtle advantages is the award tracking built into the program gives you instant review of your progress. A very nice feature for many hams.

I have been using computer logging for several years now, and it just seems to be a part of operating once you start using it. Yet, I am still running across hams who are using pencil and pad. There is an advantage to hard copy as you will read a little later in this column, but there is no way to get the instant lookup nor the ease of recording afforded by the many ham programs available today. This program is another example of good logging with a slightly different slant that stands on its own merits.

The program can be downloaded, as freeware and fully functional, from [www.faria.net/w1sql/] (new in The Chart). It is several megabytes and I was glad, at least this once, that it comes in three floppy-size files so I could transport it handily from one computer to another. I found a Help file on the Web site and, not being certain if that meant the Help was separate, I printed that one.

You need the Help file to get around some of the new stuff you will see, and it is only eleven pages, but when I got the program installed there was a more up-to-date file already installed with the program. Take a look. It is an experience worth taking just to see another ham's view of how to play this digital game.

Other news

Quite a few of you write with various success stories as well as requests. It gives a lot of satisfaction to see the interest you express in the digital modes. I think these modes are the leading reason for renewed activity from hams who fell into inactivity a few years back. At least that is how I read the messages I receive on paper (includes E-mail, snail mail) and over the air and even phone calls.

I have spent some time these past several weeks with computer failure, and have managed to get some old stuff back together while I sort out a hardware problem with the latest machine. So I have busied myself with a new combination.

The only real difference today is that I have the Windows 98 operating system plugged into the old "slow" 120 MHz machine and it is really jumping through the hoops in a true form of excellence. That is compared to the performance experienced while using the fabled Millennium Edition (Me) of Windows that had been giving me fits for the past six months.

The Me experience is behind me, but there were a few pitfalls along the way. After many frustrations, I decided to take advantage of the kind offer of a Windows 98 installation disk provided by another ham. Things just had to improve. The installation process went well. Took more time than I anticipated, but things were really looking great after many pieces of software and drivers were installed. This was going to be the best of all worlds.

Ka-blooey

Disaster (Murphy?) struck. About the third day into the exercise, the hardware died. Seemingly never to open its little eyes again. After weighing various alternatives (including basket-weaving and whittling), I set that computer aside until my cooler side could approach the problem.

That was when the resurrection of the old 120 MHz machine began in earnest. It is doing well if I simply disregard a few quirks for the moment. That is, the ham programs are functioning better than under Me and the log files that corrupted during the transfers between systems are nearly restored.

The important things are in place. Of interest to some of you, the Creative Sound SB-16 soundcard is far and away a better performer than the up-to-the-minute super-

duper model, also built by Creative, that was furnished in the new quick-as-a-fox computer lying here in failed mode.

These cards are all supposed to be compatible, especially from Creative, but the old one plays music and drives the speakers as it should and, more importantly, there is no need to set the receive/transmit frequencies offset from each other so as to be on frequency with the other station. Just couldn't get those two things to work properly with the later version.

At the moment, I do not have the Internet connection solved with this new setup, so I am having to transfer files between computers that have to go to and from the Internet. Also, I failed to mention some incompatibility of files burned into a CD that only read on one of the computers in the shack. Must be some of Murphy's selective bugs.

So, at this writing, the only ham software installed, prior to the W1SQLPSK installation, was the MixW2 which, in its downloaded form, fit on a floppy and was transportable by that method. There are other skinny programs such as that which will be easily moved into place.

Of course, the answer to all this should be to get the new machine up and running. One of the reasons for continuing with this slow-machine project is that I believe there are a lot of hams who own or have available some of the older, slower machines. It is good to be able to say you can have an enormous amount of fun with something like this and not have to break the bank to get all the newest and coolest hardware.

And, if I am telling you anything of value here, it is that some of these combos will flat out-perform the new machines. Sure proved it to me when I got this on the air with the Win98 operating system.

What I am saying is simply that my preference is Windows 98. I know there are programmers who are taking advantage of some of the new platforms, but there is a downside. Some of the other programmers who have furnished excellent software for Win95 and 98 are digging in their heels and not making the old software run on the new platforms, and this means that for some of us, we have to make a choice.

I am perfectly satisfied with what I see in front of me, at least as far as Windows goes. There is more to the operating system story. For one thing, Windows is never going to quit building the "new and improved" systems. They have two more on the drawing boards at the last count. The purpose? Beats me. I am glad I am not a programmer who has to put up with all that nonsense.

Source for:	Web address (URL):
Mix W2 Soundcard program for PSK31, RTTY, new modes, MTTY, FSK31, more	http://tav.kiev.ua/~nick/mixw2/ www.nvbb.net/~jaffejim/mixwpage.htm
FREE MMHam site — MMTTY — MMSSTV	www.qsl.net/mmhamsoft/
FREE VK7AAB — SSTV-PAL — PSK-PAL	http://users.origin.net.au/~crac/
Much ham info w/SSTV downloads	www.conknet.com/~kb1hj/index.htm
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html
PSK31 — Free — and much PSK info	http://aintel.bi.ehu.es/psk31.html
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WinPSKse — PSK31 freeware	www.winpskse.com/
W1SQLPSK multisignal (up to 20) decode	www.faria.net/w1sql/
The CHART now on the Web	www.geocities.com/normandy214/ham_radio.htm

Table 1. *The Infamous Chart.*

Linux ... progress?

One of the reasons I had to overcome some unwanted problems with this old machine (other than the fact it is just plain ... old) is that I had been experimenting with what appears to be the best alternative to all this Windows hype. That is, the Linux operating system.

I still am at a loss on that one, but I am slowly getting smarter. At this point, I cannot recommend someone with no Linux experience, such as I, jumping into the system to get going in digital ham fun activities. Linux has a steep learning curve.

Continued on page 58

Hugh Wells W6WTU
1411 18th St.
Manhattan Beach CA 90266-4025

Techniques Time Line

How much do YOU know about the evolution of construction practices?

As a ham, do you recall the evolution of the electronic construction practices that have taken place over the years? Much of it was done by ham experimenters, and the resulting advancements have been incorporated into modern equipment.

Ham radio really began when an experimenter started many years back with the construction of a "radio"-type project. Perhaps, in the beginning, those experimenters weren't referred to as "hams," but eventually they were so designated to separate the stigma between commercial- and amateur-type activities, but even with commercial enterprises on the uprise during the early years, hams were the inventors, designers, builders, and producers of radio products and technology. Hams can be proud of their contributions to the advancement of electronic technology over the preceding years regardless of the end usage. World War II is essentially the dividing line in technological development, where a separation in the identity of ham versus commercial contributions began to shape up even though hams continued to be the primary technical contributors.

Just for the fun of seeing the evolution of construction practices, I've pulled together a number of photographs dating from about 1918. **Photo A** shows the construction of a Marconi Model 106 receiver. In looking at the panel very carefully, one will observe that all of the circuit elements have been brought out to the front panel, enabling the operator to have full control over the circuit's characteristics. As a detector, Marconi used a carborundum crystal. But to function as a rectifier, a small amount of battery bias was applied to the crystal for best sensitivity. **Photo B**, though not very clear, shows the internal mechanical mechanisms that were used to control the circuit

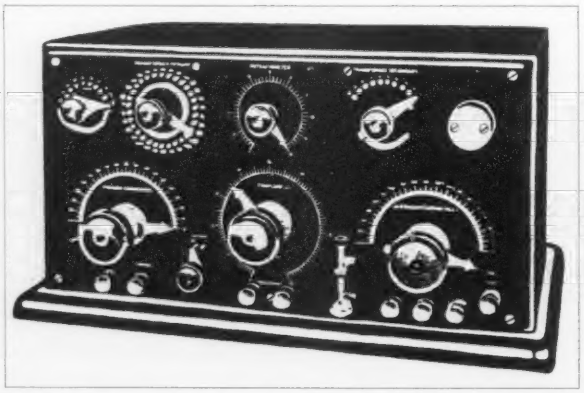

Photo A. *Front panel view of a circa-1918 Marconi Model 106 receiver. Frequency range was 86 kHz–1.5 MHz. Photo ref. 1, pg. 15.*

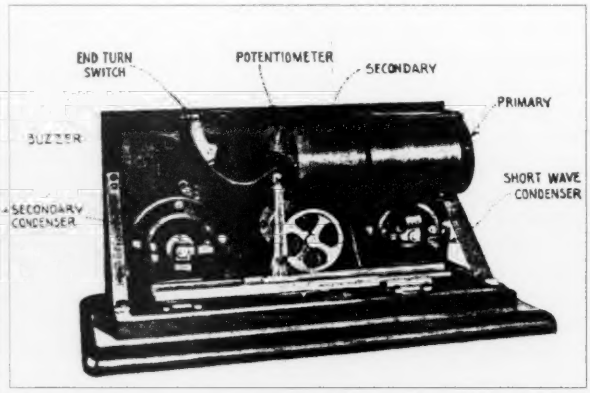

Photo B. *Rear view of a Marconi Model 106 receiver. Note the use of heavy mechanical parts used for controlling circuit elements. Photo ref. 1, pg. 15.*

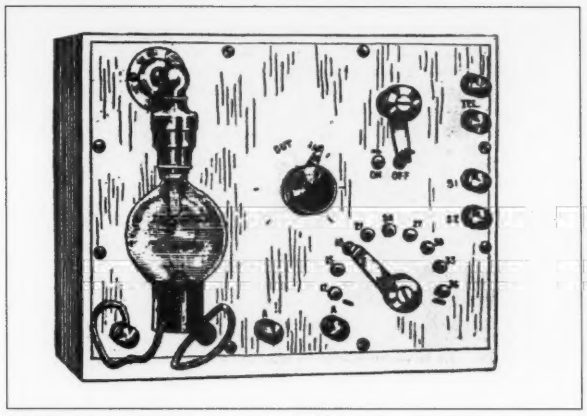

Photo C. *Front panel view of a 1920s-era amateur-type audion amplifier. This device functioned as an untuned RF amplifier. Photo ref. 2, pg. 2333.*

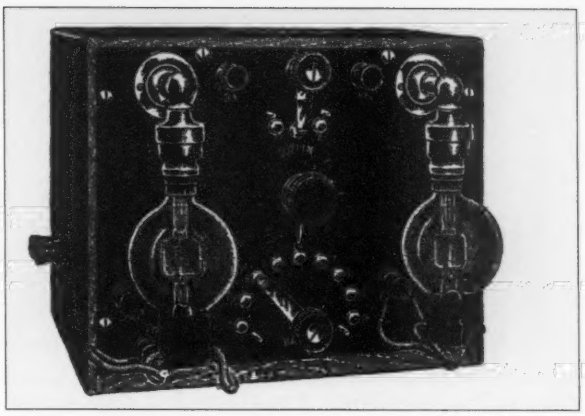

Photo D. *Front panel view of a professional-type audion detector. This type of detector was used by both the U.S. Army and Navy. Photo ref. 2, pg. 2332.*

elements. Take note that mechanics took a dominant roll in electronic construction during the early years. The tuning range of the Marconi 106 receiver was from about 86 kHz to 1.53 MHz, where the upper frequency end of the range was considered "shortwave."

If you look closely at the upper right-hand corner of the receiver shown in **Photo A**, you'll see a round object. That object is a buzzer that was an integral part of early receiving equipment utilizing point contact detectors. When using a point contact detector regardless of the base material used, the catwhisker had to be placed such that the junction created a rectifier. To determine the placement and sensitivity of the junction, a buzzer was used to create an RF noise that allowed the operator to adjust the catwhisker for the highest level of detected noise.

Although the Marconi 106 receiver was produced as a commercial venture, the construction techniques and layout provided some guidance to the construction of later equipment. **Photo C** shows an amateur type of audion "amplifier" that was developed during the 1920s era. Although it isn't a detector as we think of one today, it amplified the noise and noise amplitude variations that occurred at the antenna. Such an amplifier was used as an amateur CW receiver both with and without an additional detector. The tube used as the "amplifier" element was a triode. The tap switch mounted on the front panel changed the transformer turns ratio between the primary and secondary windings of the RF transformer. Circuit resonance was done only in the antenna input circuit.

A commercial version following the amateur concept was built utilizing one tube as an amplifier and the other as a detector (see **Photo D**). Again, the circuits were only roughly resonated and were dependent upon signal energy coupled by an input transformer.

Note that the construction techniques used in the latter two circuits follow the construction practice established by Marconi design practice. All of the circuit elements are terminated on the front panel for full operator control.

Following the experiments and developments provided by Edwin Armstrong, and particularly the regenerative detector, receiver development took a large surge forward as shown in **Photo E**. Notice that the construction technique of bringing out circuit elements still existed in 1923, when the panel began to take on a slightly more modern appearance. Although the concept of circuit resonance was developing, the circuits used as late as 1923 were only beginning to show a need for resonance. The large knobs on the front panel controlled two variometers

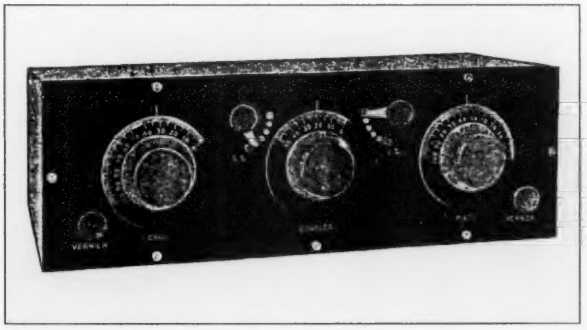

Photo E. *Front panel view of an Armstrong-style regenerative receiver. Knobs controlled variometers and feedback coupling. Photo ref. 3, pg. 152.*

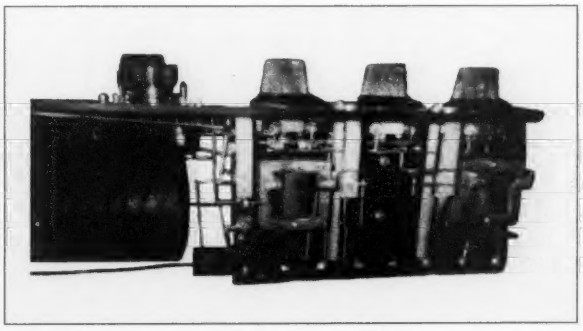

Photo F. *Construction technique of routing bare wire between connect points. Heavy-gauge wire was used to maintain mechanical separation and support.*

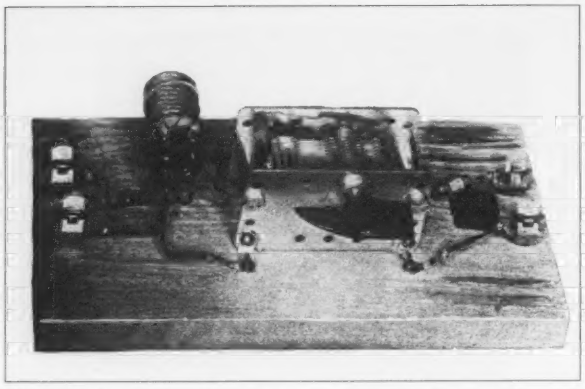

Photo G. *Breadboard layout of an amateur-built diode detector. This form of construction elicited the name "breadboard" for experimental circuit development. Photo ref. 4, pg. 27.*

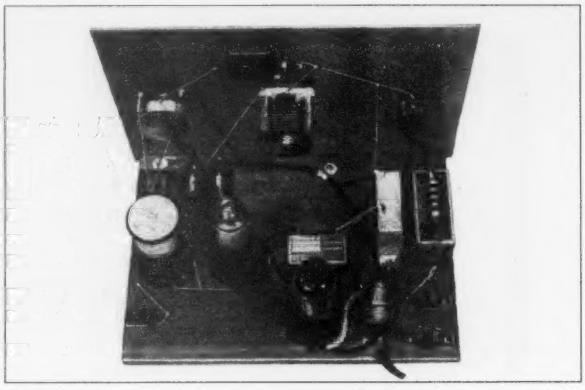

Photo H. *Breadboard layout with a metal panel for an Armstrong regenerative radio. Note the direct/straight wiring technique used. Photo ref. 5, pg. 12.*

and one variable capacitor. Coupling between the variometers controlled the regenerative feedback.

Wiring of circuits utilized heavy bare copper wire. The wire was made heavy in order for it to "fly" without support between tie points. Component mounting was against a panel without the use of a chassis. **Photo F** shows an example of an early piece of equipment using the heavy "flying" wiring technique. Routing of the heavy wire was critical only to the extent that wires would not touch regardless of normal equipment handling.

Mechanical practices continued to evolve with the passage of time, and most construction techniques practiced by hams produced equipment for personal use. As a result, emphasis on professional appearance was traded for ease of construction and circuit function. Although the detector circuit shown in **Photo G** is quite recent, it represents the use of wood as a "chassis" for the circuit as was used earlier. The word "breadboard" as we use it today developed from the use of wood products in the construction of experimental and ham electronic projects. Many commercial radios evolved out of the 1920s era with electronic components mounted on a wooden base. Some of the radios utilizing a wooden base had grooves cut into the bottom of the board. Wires were routed along in the grooves to provide mechanical stability and to keep the wires from touching. One might consider the practice as an early "wiring board" which we now refer to as a printed circuit board (also known as a printed wiring board).

The next step in wiring from the grooved technique was the use of square wire routed in a relatively square layout on the topside of the wiring board. The rigidity of the wire was important to keep the wires from flopping around and touching other circuits. **Photo H** shows a modern approach to the rigid wiring technique.

Keep in mind that the purpose of the chassis, whether wood or any other material, is to keep all of the parts "flying in formation." With that in mind, hams have tried a wide variety of construction techniques as technology has evolved. Although I don't have a chronological order for the following photographs, they do show some of the techniques that hams have used. In fact, hams continue to utilize the "breadboard" approach as is shown in **Photo I**. Perforated board has been a simple solution for the ham experimenter because it allows for flexibility in circuit development. In this example, Fahnstock clips allowed for a wide

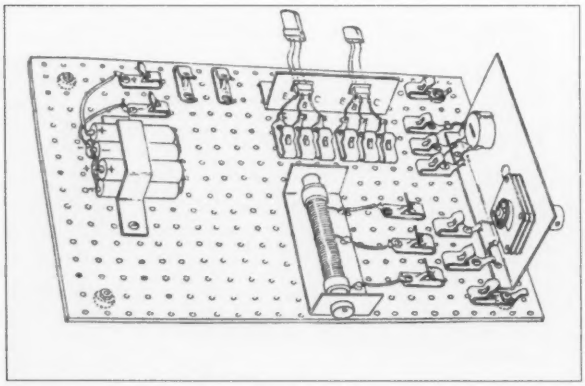

Photo I. *Use of a perforated board for mounting components. Note that circuit designs can be varied by sliding wires into the appropriate Fahnstock clip. Photo ref. 4, pg. 161.*

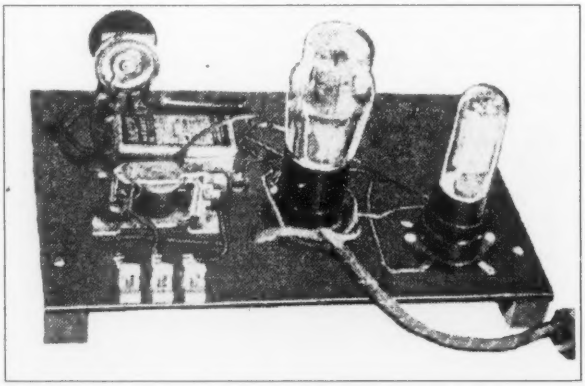

Photo J. *Note the use of phenolic or Masonite board supported by wooden strips. Experimentation is made easy using the technique of open space and direct wiring.*

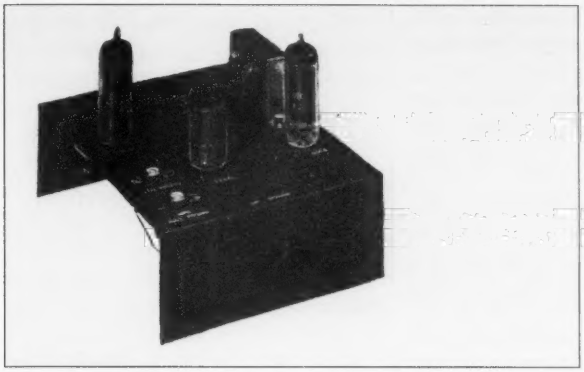

Photo K. *This project was built on a piece of sheet metal bent into the shape of a letter "U". Open construction allows for easy wiring and the metal provided an early measure of RF shielding. Photo ref. 4, pg. 47.*

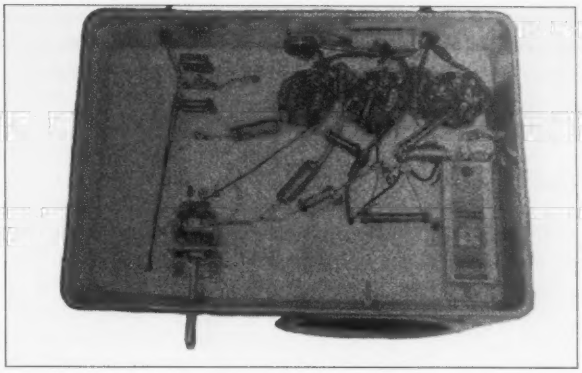

Photo L. *Aluminum bread pan or cake tin. The rolled edge is safe to handle during construction. In addition, the rolled edge and tapered sides provide rigid support for the project. Photo ref. 5, pg. 18.*

variety of experimental circuits utilizing one board and one set of components.

Getting back to the wooden construction technique, **Photo J** shows how a thin board is screwed down to a set of wooden runners. This technique allowed components to be mounted on both sides of the thin board. Circuit wiring has evolved at this point in time with insulated wire so that direct wire routing is possible. A direct wiring technique works most of the time, but as frequencies supported by the project rise, wire routing becomes very critical.

Following WWII, sheet aluminum became readily available to the amateur community. Being a soft material, its use in ham construction projects took a sharp rise. **Photo K** shows one of the early construction techniques where the metal was bent into the shape of a "U". You'll notice that the shape follows the technique shown in **Photo J**, where the turned down metal ends are used as a support,

My all-time favorite construction technique utilizes an aluminum pie or bread tin. Yes, many iron/steel/aluminum pans were available following WWII, with the aluminum ones being the easiest to work. One example of ham construction on an aluminum pan is shown in **Photo L**. The great advantage of bread pans was that they were available at the local grocery and "Five and Dime" stores at a price even a kid could afford. If you haven't built an electronic project on a "pan," I recommend that you consider doing so. The pleasure of the project, simplicity, and low cost are very rewarding. Besides, the project will most likely work the first time it is powered up.

With the evolution of semiconductors and printed circuit boards, tubes continued to be used for some time. With the "push" toward miniaturization, tubes were decreased in size to meet the need. It wasn't much of a surprise to see small tubes mounted on circuit board material as shown in **Photo M**. During the transition period, tubes were more reliable and met existing circuit designs, and continued to be used in critical applications. The use of transistors created a sharp rise in circuit development supporting semiconductor technology.

As semiconductor reliability and complex circuit integration increased at a rapid pace with the usage of printed circuit boards, construction techniques continued to advance along with electronic technology. **Photo N** shows a typical board populated with modern components. Circuit trace lines were pushed ever closer together in support of higher component density. Take note that bare circuit traces have taken on the appearance of the historic heavy-gauge wire (refer to **Photo F**). If it weren't for the circuit board, the traces would he "flying"

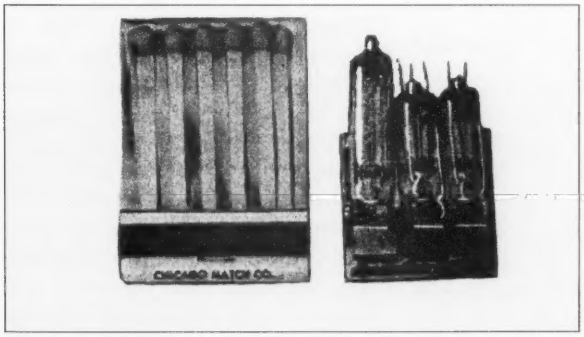

Photo M. *Miniature tubes mounted on a printed circuit board. Photo ref. 6, pg. 174.*

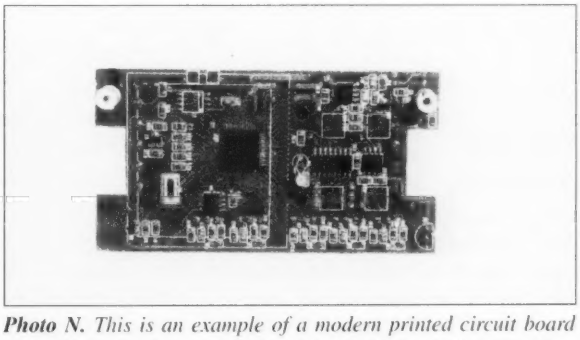

Photo N. *This is an example of a modern printed circuit board using LSI technology where the wiring is "flying in formation" as was used during very early circuit construction.*

freely in the air. Allowing one's imagination to wander, one might see construction history repeat itself as time continues, but new developments will support the latest technology.

Conclusion

As large-scale integration continues to advance, reliance upon mechanical structure will increase rather than decrease. History will repeat itself when it comes to construction practices, but perhaps at a more sophisticated technology level.

After reviewing the photos of the various construction techniques, please note that very little has changed over the years. Yes, the packaging methods have evolved and shifted to meet an appeal. Wiring techniques have evolved to "fit" the situation, but every mounting structure in existence today still has as its sole purpose keeping the parts and wires "flying in formation."

Keep 'em flying, and 73!

Photo references

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2. *Hawkins Electricity.* Dated approximately 1920.
3. Gernsback, S. Lescarboura, A., & Secor, H. W., *Wireless Course in Twenty Lessons,* New York: Experimenter Publishing Co., Inc. 12th ed., 1923.
4. Stern, Lothar, *Electronics Made Easy,* Chicago: Popular Mechanics Co. 1956.
5. Editorial Staff, *Radio for the Millions,* New York: Popular Science Publishing Co., Inc. 1943.
6. Garner, Louis E., *Electronic Experimenter's Handbook,* New York: Ziff-Davis Publishing Co. 1958. 73

Letters

continued from page 8

to his exposure on "Coast to Coast AM" *73* is regaining the stature it once had, and the "grim reaper" of ham radio publishing will have to wait once again.

Gee, Bill, didn't know you were looking for work. But seriously, thanks for putting several of us in the hospital with dislocated shoulders and arms from patting ourselves so hard on the back. Immodest? I hope nobody ever accuses us of that!

But really seriously, just as we thank you for your kind words (not to mention your immense contributions to amateur radio through your "Looking West" column, Westlink Report, *Young Ham of the Year,* Amateur Radio Newsline, *and who knows how many other things), we print this letter only as a means to point out a few things and make a pledge to our readers.*

First of all, it is true that 73 *would not be in existence if there had not been El Supremo. And it is certainly fair to say that Wayne's spirit infuses* 73 *and directly drives his editorials.*

But as I have always heard Wayne say since I first walked through these doors 27 years ago, 73 *is not about Wayne. It is about you, the reader, the average ham in the street, the everyday radio amateur from Oshkosh to Oslo, from New York to New South Wales, from Mexico to Murmansk.*

We are not some big organization with agendas and axes to grind (or to not grind, as the case may be). We are not for the rich and the niche. We are — as the saying goes — of the hams, for the hams, and by the hams, and we intend to stay that way. Promise.

So keep those letters, cards, articles, photos, and whatever coming in — we love 'em and do pay attention to them all.

And thanks again, Bill, for thinking of us. — J.B.

Arne N6XNA. Over the years since I started in amateur radio 43 years ago, I have found your publications very easy to understand, well written, and right to the point! I hope you continue with them for years to come! Thanks again and keep up the great work! 73

Restoring an HQ-140-X — Part II

continued from page 30

both the 40- and 20-meter bands, the receiver was hearing stations comparably well against the solid-state radio.

A signal sensitivity test between the Hammarlund HQ-140-X and the solid-state radio was about 4:1 better for the solid-state, but with each listening to the same station and evaluating by ear, the 4:1 in sensitivity difference between the receivers was hardly discernible.

Having the opportunity of working with my Hammarlund HQ-140-X once more brought back a lot of nostalgia. Although I may never "need" the receiver as part of my station, just knowing that it is healthy and ready to operate gives me a very warm feeling.

NOSTALGIA!! What a powerful tool!

Manual references

If you are in need of a manual for your receiver, try these sites:

- [http//bama.sbc.edu/hammarlund.htm]
- [http//www.radioprints.com] 73

Travels with Henryk — Part 5

continued from page 32

While leaving Trondheim, I noticed a tower with quite a large HF array (**Photo G**), but the owner, Esgil LA9MB, was abroad then so I could not meet him.

The Norwegian landscape is amazing north of Trondheim. I was lucky to have good weather most of the time. The country is both green and populated even north of the Arctic Circle. Passing Narvik, an important harbor town, I could not avoid seeing a very lovely radio shack with a nice antenna. The local radio club, LA1N, has its station here (**Photo H**), but (of course) nobody was there.

Next time, I'll have to prepare myself better and try to meet more of Norway's 7,000 hams! 73

Icom Interface, Texas-Style

continued from page 35

One thing bothered me. I was always used to monitoring my signal, but the Icom has no internal monitor. You can't tell what you are sending, and if you are new with these modes you have no idea what the signals are supposed to sound like. Sometimes and for some unknown reason, transmitting stops, and if you are watching your keyboard you type away, and when you sign you suddenly discover you were not transmitting, and lo and behold you have lost your contact.

It was then that I decided to build my interface to monitor my signals. At first glance, the interface circuit looks like the conventional type. With a few simple additional parts, I was able to not only monitor my signals but also be able to switch to either the Accessory input or the Mic VOX circuit. This comes in handy for some programs, and although you can use it on any of the programs, some, like BTL RTTY, use VOX only. The circuit is self-explanatory with a few exceptions. All of the parts can be purchased from Radio Shack if you don't have them in your junk box. But I have to emphasize one thing — to use the monitoring, you must have amplified speakers — the conventional non-amplified speaker does not work. However, I think they can be made to work by replacing R3 with a low-resistance volume control.

Now, the only thing I will mention about the circuit is to be sure to connect the A, B, and C shields to the #2 pin on the ACC Din plug. Other than that, just follow the circuit. 73

Windowsill Mount for Verticals

continued from page 36

first to protect it from the elements. Wood will absorb moisture rather rapidly, and will swell and break off where the window is pressing down upon it. In both cases, I would make the board approximately 6 inches or more in width, and to not exceed an outside length of 2 feet.

For the angle brackets, I would use a tempered metal, perhaps 1/8-inch steel or aluminum, long enough to be able to straddle the windowsill for proper support and able to take the strain pressure of the clamp. In most cases, the window pressure upon the board will suffice to hold it in place, but don't take chances, and employ an insulated safety line on the antenna. This is especially important if you are located 15 stories above the street, which was my case. I wanted to ensure that the board and antenna would not have an encounter with a citizen walking below.

The coax is run adjacent to the board. The gap between the sill and window can be filled in with styrofoam or such.

Have fun, and work some DX this year! 73

On the Go

continued from page 39

of the newspaper or the lead story on the evening news. Start small. Write a short story to be included on the "mytown.com" (or whatever your city calls it) Web page. See if the local cable company is interested in a public service announcement. Do a display at the local library. Don't promote how great we are, but instead how much we can and will help.

f. Find other groups with similar interests. We've done pretty good with the Red Cross and other such groups, but there are others. Is there a Police Department or Sheriff's Reserve? What about the state militia? This is not the National Guard but a state operated "home guard" that many states operate and does not have a federal role. Some states refer to this as the "Military Reserve"; they may be called upon to provide certain services, but probably do not have communications resources. (Haven't heard of the state militia? Hmmm. Maybe they have something in common with us!)

If people don't know we exist, we have no value to them. If they know what we can do and are counting on us, then we have real value. Our value is due to how our neighbors perceive us, not how we perceive ourselves. It's a buyers' market, and if our communities and neighbors see our value, then our role (and our frequencies) will be too valuable to use for something else.

Let me know what you are doing to show the value of our hobby. 73

Hamsats

continued from page 41

g. The use of more than one transmitter at the same time on a single satellite transponder is prohibited.

2. Digital Transponders.

a. For the Pacsats (LO-19, UO-22, etc.), each satellite is considered a separate band. Do not post "CQ" messages. Simply upload ONE greeting message to each satellite and download as many greeting messages as possible from each satellite. The subject of the uploaded file should be posted as Field Day Greetings, addressed to ALL. The purpose of this portion of the competition is to demonstrate digital satellite communications to other Field Day participants and observers.

The following uploads and downloads count as three-point digital contacts.

a. Upload of a satellite Field Day Greetings file (one per satellite).

b. Download of Satellite Field Day Greetings files posted by other stations. Downloads of non–Field Day files or messages not addressed to ALL are not to be counted for the event. Save DIR listings and message files for later "proof of contact."

c. Satellite digipeat QSOs and APRS short-message contacts are worth three points each, but must be complete verified two-way exchanges. Remember, only one digipeat contact is allowed for the ISS, and one for PCSat (NO-44).

d. The use of terrestrial gateway stations to uplink/downlink is not allowed.

e. If FO-29 is active, the JA transponder can be used for analog CW and phone activities under the analog transponder rules, and the JD system can be used as a separate transponder under the digital rules.

Sample Satellite Field Day Greetings file

Greetings from K5OE Field Day Satellite station near Katy, Texas, with 22 participants, operating class 2A, in the AMSAT-Houston group with the Houston Amateur Television Society and the Houston QRP group. All the best and 73!

Note that the message stated the call, name of the group, operating class, where they were located (the grid square would be helpful) and how many operators were in attendance.

3. Operating Class.

a. Stations operating portable and using emergency power (as per ARRL Field Day rules) are in a separate operating class from those at home connected to commercial power. On the report form simply check off Emergency or Commercial for the Power Source and be sure to specify your ARRL operating class (2A, 1C, etc.).

b. The Satellite Summary Sheet (AMSAT Web site) should be used for submittal of the AMSAT Field Day competition results to Bruce Paige KK5DO, Vice President User Services, P.O. Box 310, Alief, TX 77410-0310. Make sure to also send your Field Day photographs with your submission! The deadline for submissions is August 1, 2002. You

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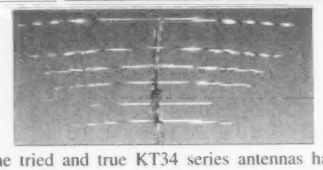

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can also send your entry sheet electronically to [kk5do@amsat.org].

c. If your score is in the top five, you will be requested to submit dupe sheets for the analog contacts and DIR listings and downlinked files for the digital contacts. 73

Above & Beyond

continued from page 43

on my unit I provided for a take-off from the 1/2 synthesizer frequency on the divide-by-2 chip, U4 a UPB584 IC pin #7. This normally is coupled through a 330 pF chip capacitor to the synthesizer input U2, a 3036 IC, pin # 28. I coupled out of this spot (U4, pin #7) on the PC board with a 5 to 10 pF chip capacitor to the IF amplifier input with a short section of >.085 copper hard line.

The half frequency of 2592 MHz is 1296 MHz and is used for calibration at this spot frequency for 1296 MHz operations. It's a natural as long as it can be obtained so easily for such little effort. All that is required is to connect to a small amplifier to increase this low power level feeding pin #28 of the 3036 synthesizer chip. The amplifier I used here is a Qualcomm transmit IF amplifier normally used for the 1 GHz IF. Bandpass on this IF amplifier is sufficient to allow operation from 800 MHz up to about 1600 MHz without retuning, making it a simple amplifier to use at 1296 MHz.

The entire package can be constructed into a BUD box, or you could construct one out of double-sided copper circuit board. Solder sections to form a box for the PC boards fitted with coax connectors and power feedthrough capacitors for DC connections. An alternate construction method is to use strips of copper or hobby brass 1/2- to 3/4-inch wide to solder to ground foil edge of the amplifier multiplier PC boards.

Well. there you go. That's all for this month. Next time, I hope to get into describing a 1296 MHz power amplifier module that can be converted from available surplus material. On the back burner is further involvement with continuing this marker project to develop keying CW ID and amplification for a beacon package. Don't know if it will all come to pass but I am trying to put the total system together using available material. If you have any questions about this or other items, drop me an E-mail at [clhough@pacbell.net]. Multiplier PC boards are available from me at $20 each plus postage of $3, California residents, please add sales tax. Further information is posted on the Web page for the SBMS at [http://www.ham-radio.com/sbms/]. Look under technical papers from the San Diego Microwave Group. 73

The Digital Port

continued from page 51

One of these days, I fully intend to get enough of that steep business behind me to the point I can report to you that it does work. In the meantime, I will just keep teasing you with bits and pieces of how it is going. As yet, I surely will not promise I can ever make it sound easy. It is simply my challenge.

Good stuff lasts

Just another little aside. I was looking at this ancient keyboard I bought sometime in the eighties and realized how you tell if you get a good one. If you are like me, you have thrown away a number of cheap, failed keyboards after maybe a year or so, and if that is the case, you never see what I am looking at. This keyboard has the identifying letters worn off the keys used to carry the letters "E, T, A, R, I, S, H, N, U and O." All the most popular letters in the English language have proved their popularity on this old keyboard that just "keeps on tickin'."

That is the way I would like to see software. Many hams are not aware of a nifty soundcard communications package called RITTY. This is a DOS program that deserves a bit of attention. I have never devoted time to it, though I did download a demo copy once. It was hard to put it through its paces in the demo version, because it would only run for a few minutes — just about long enough to set the parameters and tune a signal.

However, I have worked hams who swear by it on RTTY. There are some advantages to writing such software for DOS rather than Windows, in that the Windows overhead, when not running, frees up a lot of the computer for the really important things programs are meant to do.

That's it for this month. Hang in there and keep the airwaves buzzin' digital. Let me know if I can help. 73, Jack KB7NO. 73

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NEVER SAY DIE

continued from page 48

Where can I shop for used ham gear? Any sites for DXpedition info?

If you get me excited about what's doing on six meters or Web sites I should be visiting, I might not keep ragging the readers with great big, fat, constipated guts hanging over their belts about changing their diets and adding 30 or so healthy years to their lives.

How can you get your gems to *73?* Easy. E-mail to [design73@aol.com]. If you have nondigital photos, then send your article, photos, and a disk copy of the text to 73 Magazine, 70 Hancock Road, Peterborough NH 03458. Any questions? Call Joyce at 603-924-0073.

Your stories of the fun and excitement ham radio has provided you will not only make *73* more interesting, it'll give me material for a booklet clubs can give to youngsters to get them off the streets or out of their PCs. We need to have stuff like that so we can get kids interested in hamming. We have to either advertise and promote the hobby or it'll blow away.

One more thing. We've got around a half a million inactive hams. How about your ham club investing in a phone ROM and getting the members to get on the phone, call the hams in the area, find out why they're not active, and then let me know. Oh, also ask them what it would take in a ham magazine to get them to subscribe. I really need to know that! In addition to getting a lot of valuable information, you just might be able to get some of these guys to come to club meetings. That's if you have interesting meetings … you know, like having me give a talk via a phone amplifier.

The Hep-C Generation

Have you built or bought a blood purifier yet? You, your family and your friends all sure could use one.

An E-mail from a chap in Florida reminded me to get on your case. After a year's medical treatment for hepatitis-C, with no success, he was scheduled for a second year. Instead, he used the blood purifier two hours a day for a month and then, when his doctor tested him, his blood was completely free of hepatitis.

If one of the generous billionaires who are sending drugs to Africa to help fight Hep-C, malaria and AIDS would send a few thousand blood purifiers instead of drugs, a more serious effort could be made toward cleaning up the miseries these and other blood-carried diseases (like bilharziasis) are causing.

Mass production in China could get the cost down to under $10 a unit. We've got very nice wristwatches selling for a buck, perfectly good telephones for $5, great little radios for $5, and cassette players with earphones for $10, so we're seeing how cheap it's possible to mass produce electronics.

Also, when we're dealing in prescription drugs it is wise to remember that they are the fourth leading cause of death in America.

Of course, if we could convince people to stop putting toxic crapola in their bodies there wouldn't be any need for drugs or blood purifiers.

The Savage Breast

Yep, here I go again, hoping I can get you to share the joy I get from music.

Some pieces of music bring back memories. Listening to *España* by Chabrier reminds me of the many hours I spent in the San Francisco USO during WWII, playing this record in their music listening room. This was during the six months I spent on Treasure Island at the Radio Materiel School, one of the happiest school experiences of my life. I loved learning about electronics, radio, sonar and radar. I ate it up.

I never forget the first time I heard Beethoven's *Sixth (Pastorale) Symphony.* I rushed downtown, bought the album and then sat in my fraternity house living room with my ears right up against the speaker, playing the symphony over and over. And over, absorbing every note in every cell of my body. I still never tire of listening to this gem.

I remember right where I was driving when I first heard Gottschalk's *Tarantella* on my car radio. Now I keep a Gottschalk CD with that piece in my car player and play it endlessly. I have no idea why music does this to me. My folks never bought any classical records, nor listened to it on the radio, yet the first time I was exposed to it I fell in love.

This was back in the old days when families had friends over for dinner. My folks and I had dinner with Bob and Mary Sullivan. After dinner Bob played some of his Gilbert and Sullivan operettas and his classical records. I was instantly hooked on both. Probably something from a past life clicked in.

If you'd like to share this part of me I've written a guide to the best in classical music. See #33 in the Radio Bookshop ad.

It was my need to share the enjoyment amateur radio has brought me that got me to publish this magazine. The excitement of working rare DX; making ham satellite contacts; pioneering NBFM; pioneering RTTY; making moonbounce contacts; working seven states on 10 GHz; operating from rare DX spots around the world; DXpeditions; building my first transceiver; flying around the world operating a 20m SSB rig from the plane; sigh.

Amateur radio has brought me a lifetime of enjoyment, excitement, and adventure … which I want to share so I can help make your life happier and more fun.

That's also why I can't stop trying to share what I've discovered about health and making money… and help you discover what a patsy you (and everyone else) have been … so you can wise up and beat the odds.

Higher Education

This is a $225 billion industry with 4,000 public and private institutions and 14.5 million students. More than 3,000 of the institutions are offering Web classes, and this is causing a paradigm shift in teaching. The two earlier paradigm shifts were the invention of the Greek alphabet in the 8th century B.C., and Gutenberg's press in the 15th century.

The largest of the on-line universities is the University of Phoenix, with 90,000 students. Now thousands of people are getting their college degrees via the Web, anywhere in the world, and while holding their day jobs. Further, they don't have to take obligatory courses which might be of little practical use to them. And, if they think a course stinks, there are a lot of other choices available.

Because I was a ham my high school career advisors pushed me to go to an engineering university. I went to Rensselaer and hated every minute of the classes. I did have a good time hamming, and with the radio club, the glee club and the RPI Players. Then came WWII — you've probably read about it — and four years as an electronic technician in the Navy. When the government offered to pay for my college I went back to finish the other two years. But by then I'd started to wise up. I saw that engineers were, as a rule, not making a lot of money. The bigger bucks were in management, so I changed to Management Engineering. That didn't change things much — the courses still sucked and the educational mode was memorization, followed by exams. My short-term memory was taxed to its limits. Well, I did have a ball with my ham station at the fraternity (Sigma Chi) house, and was made president of the radio club, which I expanded from about twenty members to over 400. I established WRPI, the campus broadcasting system, which today is the school's largest student activity.

Continued on page 61

PROPAGATION

Jim Gray II
210 East Chateau Cir.
Payson AZ 85541
[akdhc2pilot@yahoo.com]

Wild Fluctuations

Propagation conditions are expected to fluctuate enormously in the early part of the month, with Very Good (VG) and Very Poor (VP) days both appearing before the 15th. The very best days usually precede the very worst ones, so look for peak opportunities to occur on the 6th, 7th, and 8th.

I suspect that a major solar disturbance may develop on the 9th, so anticipate poor conditions from there through the 13th. Propagation during the second half of the month will be less erratic and generally on the good side of fair.

Since we are approaching the summer solstice, expect low MUFs and strong signal absorption during the middle part of the day. Because 10 and 12 meters are limited at this time of year, most daytime activity will be on 15, 17, and 20 meters. These bands often become saturated by midmorning, especially on Good (G) days, so your best opportunities will usually come right after sunrise. Europe, the UK, and Russia are likely to be the hot spots, but daylight paths to other parts of the world should be workable up to noon and before sunset. The strongest signals will be found along the morning and evening gray lines and at other times on long paths across the Antarctic night. These paths are good for reaching areas such as Indonesia, Southeast Asia, the Indian Ocean, and South Africa. After dark, 20 meters will be your mainstay and provide very broad openings, but when atmospheric noise is low, 30 and 40 meters will give better results, especially when working south of the equator.

This is also the season to look for sporadic-E. This daylight phenomenon is very hard to predict and can occur from the equator (the most likely region) up to the auroral zone. Peak times to look for sporadic-E openings are in late morning and at sunset, especially when solar flux values are very high. When found over the United States, these dense ion "clouds" typically drift westward at several hundred miles per hour and provide strong openings lasting from a few minutes up to two hours. This is one reason not to become overly discouraged with the onset of the "summer doldrums."

June 2002

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F
2 F-G	3 G	4 G	5 VG	6 VG	7 G	8 F-G
9 VP	10 VP	11 P	12 P	13 F-P	14 F-G	15 F-G
16 F-G	17 G	18 F-P	19 F-P	20 F-G	21 G	22 F-G
23 F-P	24 F-G	25 F-G	26 F-G	27 F-G	28 F-P	29 F-G
30 G						

EASTERN UNITED STATES TO:

Central America	15-20	(15) 30	20 (40)	(20-40)	x	(20)	20	(20)	(15)	(15)	15 (20)	(10) 17
South America	15 (20)	(15) 20	20 (40)	(20-40)	(20)	x	(15)	(15)	x	(10)	(10-20)	(10) 20
Western Europe	20	20	(20-40)	(40)	x	(20)	x	x	x	x	(20)	20
South Africa	x	(40)	x	(20)	x	x	x	x	(15)	(15)	x	x
Eastern Europe	20	20 (40)	(20)	x	x	x	(20)	x	x	(15)	(15)	(20)
Middle East	20	20 (40)	(20)	x	x	x	x	x	x	x	(20)	(15)
India/ Pakistan	(15-20)	(20)	x	x	(20)	x	x	x	x	x	x	x
Far East/ Japan	(15)	x	x	x	x	x	(20)	(15-20)	(15)	x	x	(15)
Southeast Asia	(15-20)	x	x	(20)	x	x	(20)	x	x	(15)	x	x
Australia	(15)	(15)	x	x	(20-30)	(20-30)	(20)	(20)	x	x	x	x
Alaska	(15-20)	(15-20)	(15-20)	20	20 (40)	(20-40)	(20)	(20)	x	x	(15)	(15-20)
Hawaii	(15-20)	(15-20)	(15-20)	20	20 (40)	(20-40)	(20)	(20)	x	x	x	(15)
Western USA	(10) 30	(10) 30	(10) 40	(15) 40	(20) 40	(20-40)	(15) 20	(10) 20	(10-20)	(10-20)	(10-20)	(10) 20

CENTRAL UNITED STATES TO:

Central America	(10) 20	(15) 30	20 (40)	20 (40)	(20-40)	(20)	(20)	(15) 20	(15-20)	(10-20)	(10-20)	(10) 17
South America	10 (20)	(10) 20	(15) 30	(15) 30	(20-40)	(20)	(20)	(15)	(15)	(10)	(10-15)	(10-20)
Western Europe	(15) 20	20	(20-40)	(20-40)	x	(20)	(20)	x	x	x	x	(15-20)
South Africa	x	x	(40)	(20-40)	(20)	x	x	x	(10-15)	(10-20)	(20)	x
Eastern Europe	(20)	(20)	(20)	(20)	x	x	(20)	(20)	x	(15)	(15-20)	(15-20)
Middle East	(15-20)	(20)	(20)	(20)	x	x	x	x	x	x	(20)	(20)
India/ Pakistan	(15-20)	(15-20)	(20)	x	x	x	(20)	x	x	x	x	x
Far East/ Japan	x	(15)	(15)	x	x	(20-40)	(20)	20	(20)	x	x	x
Southeast Asia	(15)	(15)	(15-20)	(20)	x	x	(20)	(20)	(15-20)	(15)	(15)	x
Australia	(15)	(15)	(15)	(20)	20 (40)	(20-40)	(20-40)	20	(20)	x	(15)	x
Alaska	(10) 30	(10) 30	(10) 40	(15) 40	(20) 40	(20) 40	(20-40)	(15-40)	(10) 30	(10-20)	(10-20)	(10) 20
Hawaii	(15-20)	15 (20)	(15-20)	20	20	(20)	20	(20)	x	x	x	(15)

WESTERN UNITED STATES TO:

Central America	(10) 17	(15) 20	(15) 20	20	(20)	(20)	(20)	(20)	(20)	(10-20)	(10-15)	(15-20)
South America	(10-20)	(10) 17	15-20	(15) 20	(20)	(20)	(20)	(15)	(15)	x	(15)	(10-15)
Western Europe	(15-20)	(20)	20	(20)	x	x	x	(20)	(15)	(15)	(20)	(15-20)
South Africa	x	x	x	(20)	(20)	x	x	(20)	(20)	(15)	x	x
Eastern Europe	(15-20)	(20)	(20)	(20)	x	x	x	(20)	x	x	x	(15-20)
Middle East	(20)	(15-20)	(15-20)	(20)	x	x	x	x	x	x	x	(20)
India/ Pakistan	x	x	(15)	x	x	x	x	(20)	x	(15)	x	x
Far East/ Japan	(15)	(15)	(20)	(20)	(20)	(20-40)	(20-40)	(20)	(20)	(15-20)	x	(15)
Southeast Asia	x	x	(15)	(15)	x	(20)	(20)	(20)	(15-20)	(15-20)	(15)	x
Australia	(10-15)	(10-15)	15	(15-20)	20	20	20	(20)	20	(20)	x	(15)
Alaska	(10) 40	(10) 40	(10) 40	(15) 40	(20) 40	(20) 40	(20-40)	20-40	(15) 40	(10) 40	(10) 40	(10) 40
Hawaii	(10-15)	(10-20)	(10-20)	(15-20)	20	20	(20-40)	20 (40)	(20-40)	x	x	(10-15)
Eastern USA	(10) 30	(10) 30	(10) 40	(15) 40	(20) 40	(20) 40	(20-40)	(15-20)	(10) 20	(10-20)	(10-20)	(10) 20

Table 1. *Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.*

Band-by-Band Summary

10/12 meters

These bands will be weak to nonexistent due to daytime signal absorption, so don't expect much activity here. On the other hand, sporadic-E can sometimes provide some unusual opportunities just before noon and at sunset, but you'll have to rely on luck to catch any openings. When absorption isn't too great, expect a short-skip from 1,000 to 2,000 miles.

15/17 meters

Still fairly workable, these bands will deteriorate as July approaches. Normal peaks are midmorning to the east, just before local noon to the south, and from late afternoon through evening to the west. Try long paths across the Antarctic for exotic openings to the Indian Ocean and adjacent areas. Short-skip will average between 1,000 miles and 2,000 miles.

20 meters

Expect openings to most areas of the world, especially at night. Be sure to take advantage of nighttime paths to the west of you right after local sunrise, and to the east of you just before sunset. Expect short-skip to vary from 500 to 2,000 miles during the day and 1,000 to 2,000 miles after dark.

30/40 meters

Atmospheric noise from tropical and subtropical storms will often limit your opportunities here. However, when conditions are quiet, some good opportunities can be found in the southern hemisphere. Few daytime DX openings will occur and skip will be limited to short distances. After dark, expect skip to be from 750 to 2,000 miles.

80/60 meters

High static and weak signals will prevent DX openings on most days. Opportunities may occur near midnight and again in the predawn hours when 40 meters is active. Expect short-skip to vary from 1,000 to 2,000 miles. 73

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NEVER SAY DIE

continued from page 59

I had kilowatt rigs on 20m and 75m, with two Twin-Three 20m antennas that gave me humongous signals all around the world. Their extra-low angle made my signals the first in and last out, often making me the only American station the DX were hearing.

Oh, yes, education. With the competition from Web programs, universities are going to be forced to improve their curriculums and their teaching methods or go out of business. The one thing that's needed is a publication with an associated Web service which offers objective evaluations of the teaching programs available. Yes, I've a business plan for such a publication. If you know anyone with some money to invest in changing the face of education worldwide, let me know.

Quiz

What do you think is the first thing that goes through the mind of a politician when he learns that he's been elected?

Time's up.

It's his re-election campaign.

Why do members of Congress ask how high when the unions say jump? Because the unions can swing an awful lot of votes. Unions have gotten (forced) Congress to pass legislation which gave the unions the power to get workers fired if they don't pay union dues. This provides union officials with billions of dollars every year with which to influence legislation.

As you can imagine, union officials are extremely hostile to the free enterprise system. They've pushed for wage and price controls, even though these have never worked in history. They've forced up the minimum wage, thus keeping millions of youngsters from entering the workforce.

Nearly half the states have enacted laws giving forced dues privileges to union bosses for state and local employment, including most public schools.

Yes, there have been some losses of union membership in the private sector, but public service unionism has been mushrooming. The total union income has been going up far faster than inflation. And most of this money goes to salaries for union officials and staffs devoted to get-out-the-vote political activities. Then, of course, a few million here and there are for state and federal legislator re-election campaigns.

So how big are the government worker unions? 43% of government workers are unionized so far. No wonder the union bosses are pushing Congress to expand the government payrolls — that's more dues money for them.

It's the unions that are the main force preventing states from instituting school reforms, by the way.

How can poor we, the people, do anything about this mess? That's pathetically simple — just do everything in your power to make sure that no elected politician is ever, ever re-elected. One term and back to the private sector, buster. No more career politicians. No more running the country by graft. The power for change is in your hands at the next primary. If you're happy paying half your wages in taxes, re-elect your crook. If you have no problem with our schools getting more and more expensive and have no interest in your child's future, fine.

If you, your friends, co-workers, and neighbors revolt against the system by going the NRA route (Never Re-elect Anyone) this will be the biggest revolution in a couple hundred years.

Howcum?

Howcum I'm going on and on in a ham magazine about health? (a) I've been going on and on in my editorials for over 50 years about things I think should interest readers. So that's no surprise. You knew what you were getting into when you subscribed. (b) When I go to hamfests I see a large percentage of hams are fat old men with big, constipated guts hanging over their belts. We're talking prostate or colon cancer any day now. (c) Other than doing one hell of a lot of obscure research there is no way to find out what I've discovered about why we make ourselves sick and how to stop doing it. (d) I love the letters from readers who've had big weight losses or cured "incurable" illnesses. (e) If you want more ham stuff in the magazine, get busy and write it.

LTA

That's lighter-than-air ... dirigibles and cargo lifters.

An article in *Forbes* on the Cargo-Lifter company's huge hangar outside Berlin got my attention. I tried thirty years ago to get King Hussein interested in building lighter-than-air cargo lifters as a new industry for his country, but didn't get anywhere.

Dirigibles were going great guns in the early 1930s, with the Hindenburg making regular Atlantic crossings. When it burned that stopped all dirigible interest. Of course, now we know that it wasn't the hydrogen gas that exploded, it

Continued on page 62

NEVER SAY DIE

continued from page 61

was the highly flammable paint they used on the skin.

The CargoLifters will be able to lift 350,000 pounds from anywhere and put it down anywhere else. Right now it's between very difficult and impossible to move really big stuff around the country, so these LTAs are going to be kept busy.

The article mentioned that the Zeppelin company currently is taking sightseers daily for flights over Lake Constance. Hmm. I'll bet thousands of *Forbes* readers will see that and turn to the next page. I quickly tore out the page and read the Lake Constance part to Sherry. We're going for a Zeppelin ride as soon as we can organize it. We haven't visited nearby Luzerne and Bern in years, so we'll drive around a little, too. Maybe have some Black Forest cake at the Hohenzollern Castle again.

Prostate

Now that most hams are well into their prostate cancer years, the article in the April 22nd *Newsweek* should have caught their attention. The headline cited changes in diet and lifestyle as a choice over conventional treatment. Hey, isn't that exactly what I've been preaching?

Dr. Dean Ornish said, "Your body often has the ability to begin healing itself if you stop the behavior contributing to the problem." Now you've gotten it from a doctor, so that makes it true. Right?

Many men are unwilling to go the surgery or radiation route, considering their side effects (like impotence) and high recurrence rates (around 40%), so the diet and lifestyle change is attractive. Read my book.

HGH

You've probably heard the commercials for HGH, the human growth hormone. Great stuff, probably, but according to the *Harvard Health Letter,* it's only effective when injected. Worse, unless you've got a confirmed growth hormone deficiency, there's no real justification for these pricey injections — which cost about $20,000 a year. And worse, yet, they're now suspected to increase cancer risks. Just what you need.

The newsletter goes on, "Despite label claims, there are no over-the-counter pills, sprays, or creams that contain HGH." No wonder I'm hearing from people using them who claim they've seen no results.

Those Tests

Politicians love the idea of administering standardized tests to evaluate how our schools are doing. Yes, you bet there are some problems. Aren't there always when the government messes with things?

The problems? Well, for one, since the tests don't count as part of school work more and more students have wised up and are just ignoring them, marking "c" for every answer. That way they can get it over in a few minutes instead of wasting an hour or so.

For another, since the tests are kept secret to prevent teachers from teaching to them, they often ask irrelevant questions, with some requiring facts that even the teachers don't know.

If I Were President

Thomas Sowell (you should read his books) wrote in an essay that if elected president he'd immediately shut down all schools of education. Then he'd pay every professor of education $1 million to never teach nor write again. He figured that the $40 billion spent on this

Continued on page 64

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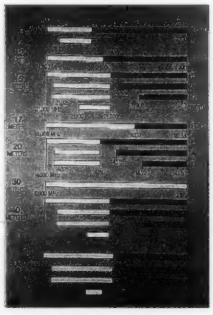

To start off the flow of materials, include $5.95 for up to 2 pounds of training materials, and send your request to:
Ham Ambassadors, Gordon West Radio School, 2414 College Drive, Costa Mesa CA 92626.

Please note: **All requests** must be accompanied by a class flyer for your upcoming course, including class dates and location.

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2001 expanded edition (156p). $10 (#05)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. $5 (#02)

The Blood Purifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean your blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. It's working miracles! $10 (#01)

Plant Growth Stimulator: This has the same circuit as the above, all ready to use. Postpaid: $155 (#PGS).

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the *Drum*. $5 (#10)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (#11)

73 Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. Yes, of course we pay for your articles! $0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? $5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. $5 (#32) No, I'm not a nut case.

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gottschalk's fabulous music! $5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. $3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. $40 (#52)

Reprints of My Editorials from *73*. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system,. our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 100 Editorial Essays: $5 (#72)
1997 157 Editorial Essays: $8 (#74)
1998 192 Editorial Essays: $10 (#75)
1999 165 Editorial Essays: $8 (#76)
2000 101 Editorial Essays: $5 (#77)
2001 104 Editorial Essays: $5 (#78)

Silver Wire: With two 5-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (#80)

Colloid Reprint. April 97 article on a silver colloid maker, history, and how to use the stuff. $5 (#98).

Colloid Clips. Three 9V battery clips, 2 aligator clips & instructions. $5 (#99)

Silver Colloid Kit: $25 (#80-98-99)

Four Small Booklets Combined: Dowsing: why and how it works: Super Organic Food: a trillion dollar new industry: Schools in 2020: another $ trillion industry; Anthrax, a simple cure. $3 (#86)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. $30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. $25 (#92)

Dark Moon Video: 222-minute exposé nailing NASA with their own photos. If you've watched the NASA films of the astronauts walking on the Moon and wondered at their weird gate. Wait'll you see it speeded up. It looks exactly like they're running on Earth! They catch NASA in dozens of give aways that the photos and films had to have been faked. With our gov't it seems to be just one cover-up after another. $40 (#93)

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NEVER SAY DIE

continued from page 62

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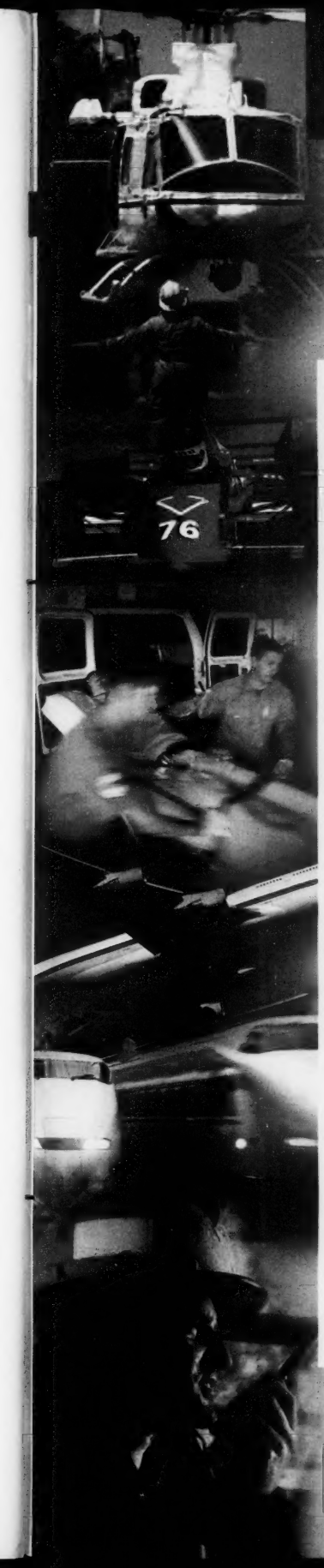

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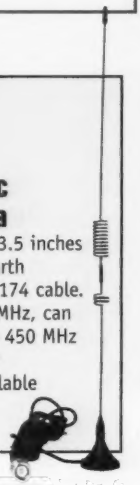

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